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WATERFOWL POPULATIONS AND BREEDING CONDITIONS SUMMER 1952

SPECIAL SCIENTIFIC REPORT: WILDLIFE No. 21

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
CANADA DEPARTMENT OF RESOURCES AND DEVELOPMENT
CANADIAN WILDLIFE SERVICE

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WATERFOWL POPULATIONS AND BREEDING CONDITIONS - SUMMER 1952

Special Scientific Report - Wildlife No. 21

United States Department of the Interior . . . . . .Douglas McKay, Secretary
Fish and Wildlife Service . . . . . .John L. Farley, Director

Canadian Department of Resources and Development. . . .Hon. R. H. Winters, Minister
Canadian Wildlife Service . . . . . .W. Winston Mair, Chief

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FOREWORD

This is a compilation of reports on waterfowl breeding ground conditions in 1952. It is a joint compilation by the Canadian Wildlife Service and the United States Fish and Wildlife Service, with cooperation by many Provincial and State Game Departments. It is published as the sixth report in a series begun in 1947 to record annual breeding ground conditions for our migratory waterfowl.

John L. Farley

Director
Fish and Wildlife Service

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WATERFOWL BREEDING GROUND SURVEY IN ALASKA

Paul D. Adams, John L. Buckley, and Urban C. Nelson

Introduction

The 1952 breeding-ground surveys covered the key waterfowl producing areas in Alaska thus providing a fourth year of similar surveys on certain areas and adding a second or third year of record to the newer areas. Northwestern Alaska surveys were made by Robert F. Scott with David Hooper as observer. Included are the Kotzebue Sound transects and those in western Alaska covering the Innoko area and the Yukon bottomlands. Surveys in the general Fairbanks area of interior Alaska were made by John L. Buckley and others with Scott as pilot on Minto Lakes and Fort Yukon Flats and Ray Woolford pilot for the Northway-Tetlin and Tangle Lakes transects. Buckley, Hooper, Kessel and Lensink functioned as observers. Yukon-Kuskokwim Delta surveys were made by David L. Spencer with Paul Adams as observer. Fred L. Robards and Charles Stovall surveyed the Copper River Flats with Warren Nystrom as pilot.

Detailed nesting studies were not possible during the past season although some observations were made incidental to other work.

Banding operations were conducted on three areas formerly worked and at one new location. At Yukon Delta, from July 3 to August 17, Refuge Manager Paul Adams was assisted by Pilot-biologist Joe E. Miner with David Hooper running the crew at Kashunuk and Igiak Bay and Matthew Peterson running the crew at the Aphoon mouth of the Yukon. Mr. Everett Schiller of the Public Health Service conducted parasitological studies of waterfowl on the delta. At Minto Lakes, John L. Buckley, Calvin J. Lensink and Leslie A. Viereck of the Cooperative Research Unit banded ducks late in the season (July 30 to August 7) in order to concentrate on diving ducks. Copper River Flats banding during the period July 15 to July 25 was conducted by Federal Aid Leader Urban C. Nelson, Stream-guard Hugh Hosick and Agent Fred Robards. At Cold Bay, Refuge Manager Robert D. Jones assisted by David C. Hooper banded geese during the period September 10 to 29. This is the first flight-route banding of black brant in Alaska and is being carried out at Izembek Bay, a major migratory concentration point just across the tip of the Alaska Peninsula from Cold Bay.

Methods Used in Sampling, and Area Covered

All transects were made by air without benefit of ground checks. One-quarter mile transects (1/8-mile on each side of the airplane) were flown in all cases except the Copper River Flats where a half mile transect was used. Some variations in transect pattern were experimented with in an attempt to obtain a better sample and to minimize the influence of factors affecting transect results.

Certain 1951 transects which sampled areas of low waterfowl density or areas of such limited extent that they were unimportant have been eliminated from the 1952 survey. Of most interest among these are the Arctic Coast transects which have shown a sparse waterfowl population ranging from 2.6 to 3 birds per square

mile over the past three seasons. Representative samples for the interior and other areas have, however, been retained in the survey schedule.

Waterfowl habitats have been described in previous reports. Izembek Bay referred to under Introduction is a large shallow bay on the Bering Sea side of the Alaska Peninsula. Partially separated from the sea by a long low-lying sand bar, it is a productive eel-grass area furnishing black brant food while the adjacent heath-berries (crowberry and cranberry) furnish food for the cackling geese and emperor geese. An immense concentration of brant, cacklers, lesser Canada and emperor geese builds up here in early September and most of the geese move on by early November but the emperors remain to winter in the adjacent islands and throughout the Aleutain Chain. A projectile-type net is used to capture these flight geese.

Weather and Water Conditions

Throughout Alaska, the general opinion was that spring was three weeks later than normal. As of June 19, on the Yukon-Kuskokwim Delta, very few nests were observed, in contrast to 1951 when nesting was in full swing by the first week of June.

June water levels were moderately high along the Yukon River but it is doubtful if nesting was adversely affected.

The Juneau airport records reflect the generally cold wet spring experienced this year in the Coastal area and southeastern Alaska: April temperatures were 3.7 degrees below the the long-term average and precipitation for the month was .65 inches greater than normal. May temperatures averaged 2 degrees lower and precipitation 3.24 inches greater than the normal. June temperatures were 0.5 degrees lower and precipitation 1.22 inches below normal. Cold, wet weather continued until June 9, and after that date it warmed up. Western Canada goose nesting was apparently unaffected since the muskeg fringes on which they nest have a sponge-like resistance to serious flooding.

Mid-summer conditions on the Yukon Delta are described in the following quotation from Refuge Manager Adams' report:

"The arrival of the banding crews at Old Chevak on July 3 was accompanied by beautiful weather which lasted throughout most of the month. During the last week of July the weather turned sour and continued so until the departure of the crews. Rain was ever present and to make conditions worse, winds harassed the crews from all directions. On August 2 a south wind reached an estimated velocity of 40 to 50 m.p.h. and brought with it a heavy pelting rain. On August 10 a second south-westerly wind also of 40 to 50 m.p.h. occurred this time in conjunction with an extreme high tide. Gear was loaded in record time and the plane, which was unflyable, was secured. The crew battled its way up river to Old Chevak, all of the while watching the flats slowly disappear. The boats were beached within 50 feet of the mission building door with the tide not yet high. At high slack only the highest ground in the area was visible. Lakes behind Chevak were flooded and rivers disappeared. By morning the wind had abated and the tides returned to normal. The geese suffered no apparent injury from high water, however, they were uniformly scattered making the banding efforts that much more diffiuclt. Such a flood during the nesting season would have surely wiped out 90 percent of the nests."

AERIAL TRANSECT AREAS AND BANDING LOCATIONS

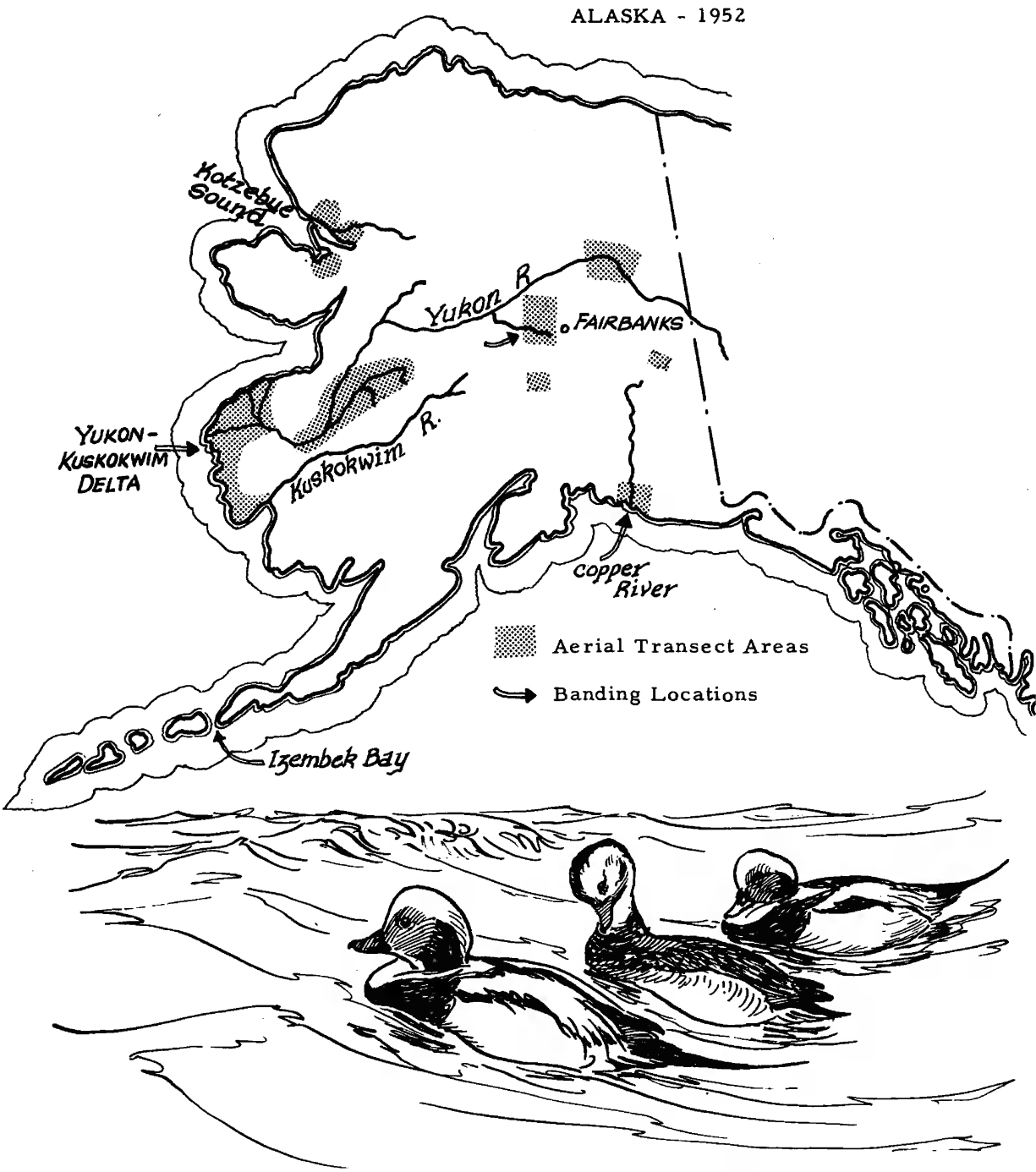

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Table I - Summary of Alaska Transect Data - 1952

Location	Date of Transects	Total Square Mile In Sample	Total Square Mile In Area	Percent Sample	Waterfowl Per Square Mile 1949	1950	1951	1952	Percent Change 1951-1952
Northwest Alaska									
1. Kotzebue Sound									
a. Noatak	6/17	34.6	454	7.6	13.3	17.8	10.3	6.5	- 37
b. Kobuk	6/18	30.8	506	6.1	32.7	19.4	10.5	8.2	- 22
c. Selawik	6/19	36.0	1,002	3.6	24.6	23.0	13.0	13.8	+ 6
2. Upper Innoko	6/9-19	41.7	1,171	3.5	11.7	18.8	14.8	12.6	- 15
3. Yukon Bottomlands	6/9-19	114.5	2,494	4.6	10.3	11.8	6.8	10.6	+ 56
Delta									
4. Yukon-Kuskokwim Delta	6/14-19	285.0	19,000	1.5	(16.5)*	(17.4)*	27.9	24.1	- 14
Interior									
5. Minto Lakes	6/9	12.7	600	2.1	-	8.7	11.6	31.3	+170
6. Fort Yukon Flats	6/10	29.0	4,000	.7	-	-	35.8	46.6	+ 30
7. Northway-Tetlin	6/17	11.2	2,000	.5	-	-	31.1	28.6	- 8
8. Tangle Lakes	6/17	5.0	200	2.5	-	-	12.3	44.5	+262
Coastal									
9. Copper River Flats	6/12-16	23.0	400	5.7	-	-	20.2	41.3	+104

* Goose concentration area not included in these figures.

Summer water levels at Minto Lakes were higher this year than last. During the first 10 days of August the water dropped four inches, by September 7, the water level was down another 18 inches. During banding operations the water was clear but with heavy concentrations of green algae.

Summer weather and water conditions on the Copper River Flats did not differ materially from the normal.

Breeding Population Trends

These data are presented in a series of tables for ready comparison with the results of previous years and to show the difference in species composition in the various waterfowl areas in Alaska.

From the Northwest Alaska surveys, Robert F. Scott concludes there have been no significant changes in any species comparing 1952 with 1951 - unlike last year when there was apparently a significant drop in pintails from 1950.

Table II - Northwest Alaska - Species Composition in Percent of Identified Birds

	Upper Innoko	Bottomlands	Noatak Valley	Kobuk Delta	Selawik
Total Tally	470	1,606	228	354	498
Percent Identified	63	3	38	62	55
All ducks	14	88	37	92	97
All geese	84	9	56	7	1
Unidentified geese	45	1	3	5	-
Canada geese	22	8	8	2	1
White-fronted geese	17	-	45	-	-
Swan	1	2	7	1	2
Pintails	5	9	7	58	29
Scaup	4	18	19	22	42
All scoters	2	39	9	6	22
Mallard	1	5	-	-	2
Baldpate	1	4	-	1	3
Goldeneye	tr.	5	-	-	-
Old squaw	-	6	-	3	-
All eiders	-	-	2	-	-
Red-breasted merganser	-	-	-	1	-

Yukon-Ksukokwim Delta transects showed an increase in white-fronted and emperor geese and eider ducks in contrast to a drop in brant, pintails, scaup, scoter and old squaw ducks. Species composition for the main delta and for a new transect in a goose concentration is shown in Table III.

Table III - Yukon-Kuskokwim Delta Species Composition in Percent of Total Tally

	Yukon-Kuskokwim Delta	Goose Concentration
Total Tally	6,870	3,192
Percent Identified	97	100
Cackling goose	31	5
Brant	7	95
Emperor goose	10	-
White-fronted goose	10	-
Swan	4	-
Pintail	4	-
Scaup	10	-
Scoter	10	-
Eider	4	-
Old squaw	3	-
Goldeneye	3	-
Others*	3	-

* Mallard, baldpate, teal and bufflehead were present in significant numbers.

Species composition in Interior Alaska areas showed no significant changes from last year although the number of samples from previous years for comparative purposes is not great.

Copper River surveys disclosed no material change in species from 1951 except for a drop in Canada geese, baldpate and mallard and an increase in pintails and scaup.

Table IV - Interior Alaska Species Composition in Percent of Identified Birds

	Minto Lakes	Ft. Yukon Flats	Northway-Tetlin	Tangle Lakes
Total Tally	399	1,352	322	224
Percent Identified	50	11	44	73
Unidentified geese	-	25	-	-
Canada geese	2	24	4	-
Snow geese	-	tr.	-	-
Pintail	32	18	3	-
Mallard	2	-	12	13
Baldpate	3	9	9	2
Green-winged teal	1	1	-	-
Goldeneye	1	-	2	23
Scaup	53	19	61	50
Canvasback	2	3	-	-
Scoters	2	-	9	12
Bufflehead	2	tr.	-	-
Old squaw	-	-	-	-

Table V - Copper River Flats Species Composition in Percent of Identified Birds
Gulf of Alaska

Total Tally	950
Percent Identified	90
Canada geese	36
Swan	3
Pintail	13
Mallard	15
Baldpate	7
Green-winged teal	1
Shoveler	7
Scaup	15
Scoter	3

The problem of adequately sampling the waterfowl habitat in Alaska has not yet been resolved. Many of the nesting concentrations occurs on relatively small areas with large blanks between. Some large, fairly homogeneous areas exist, such as the Arctic Shelf and some of the tundra areas but these support a sparse waterfowl population. Even the so-called blank areas require a reconnaissance survey to determine how "blank" they actually are and the extent to which discontinuous pockets of waterfowl habitat exist within them. Mr. Crissey of the Central Office and Messrs. Scott, Buckley and Spencer of the Regional Office have all considered the problem of adequate sampling to measure the population trend. Time of day, light conditions and experience of the observer are important factors in recording species composition. Scaup are so easily recognized from the air that numbers of this species probably are disproportionately high among the identified ducks. Lensink's Innoko report (Federal Aid Quarterly Progress Report - September 30, 1951) illustrates the disparity between aerial and ground surveys in the ratio of diving ducks (on open water) to puddle ducks (in heavy cover), in the total population. With increasing familiarity and more ground and boat checks we will reach a much firmer basis for determination of species composition on various breeding areas.

Success of the Season

The nesting success on the Yukon Delta did not differ materially from that of previous years. The storm and tide action flooding in early August, however, illustrates the precarious position of delta waterfowl should such flooding occur earlier in the season. Heavy predation by the large gulls, particularly the glaucous gull, on goslings continued. Gull predation is increased by banding operations and it is an important factor even on undisturbed portions of the goose grounds. Observations this year seem to indicate that localized gull control has thinned the gull population somewhat in specific local areas.

Parasitic infestations particularly intestinal worms apparently constitute a wide-spread and perhaps relatively constant drain on young waterfowl. Mr. Schiller expressed amazement that some of the birds could continue to function in view of the great number and volume of intestinal worms. He believes that the parasites must contribute greatly to the mortality of the birds.

At Minto Lakes, brood-size data were secured which was similar to 1951 except that scaup broods were slightly smaller and baldpate slightly larger than the year before.

Table V I - Waterfowl Brood Sizes at Minto Lakes

Species	No. of Broods 1951	No. of Broods 1952	Brood Size 1951	Brood Size 1952
Scaup	8	46	7.7	6.6
Canvasback	6	9	5.2	5.0
Pintail	72	8	6.2	5.8
Baldpate	7	8	7.0	5.9
Green-winged teal	9	7	7.2	7.7
Shoveler	11	7	7.4	7.3
White-winged scoter	0	5	-	7.6
Goldeneye	5	1	6.8	5.0
Mallard	11	0	7.7	-
Total	129	91		

Table V I does not indicate the species composition at Minto Lakes, an area chiefly important for scaup and pintail with lesser numbers of baldpate, shoveler, mallard and teal produced there.

The Copper River Flats contain probably the highest concentration of western Canada geese in Alaska. The nesting area comprising approximately 200 square miles was occupied by an estimated 4,000 nesting geese and 2,000 non-breeders. Most nests are on high slough banks along the high driftwood line in vegetation consisting largely of wild iris, shooting star and salt grass over a general area extending from the coast to 10 miles inland. Situated on the open North Pacific coast the Copper River Flats resemble the Yukon Delta in that the potential exists for serious flood-destruction of nests. Fortunately the combination of circumstances for producing such nest destruction has not occurred in recent years. Other factors affecting waterfowl production are presently of minor importance, these include: gull predation, eagle predation and brown bear predation.

Table V I I - Waterfowl Brood Sizes at Copper River Flats

Species	No. of Broods	Brood Size
Western Canada geese	12	5.4
Pintail	4	5.0
Mallard	3	5.3
Shoveler	1	5.0

On the coastal goose grounds at Yukon Delta and at Copper River combined, broods of geese were the rule rather than the exception, thus in only a few instances was it possible to segregate individual broods.

Summation of Data

In general, waterfowl densities were comparable to those of 1951. These are summarized in Table I with figures from preceding years tabulated for comparison only for those areas where the survey was such that comparisons are valid.

Northwestern Alaska breeding density was lower on two of the Kotzebue Sound transects than in 1951 - by 37 and 22 percent - the third transect, Selawik, was 6 percent higher than last year. All Kotzebue Sound samples show a breeding waterfowl population below the 4-year average and materially lower than the high years of 1949 and 1950. This year the Upper Innoko was below 1951 and below the 4-year average. Yukon Bottomlands density was up 56 percent over last year and slightly higher than the 4-year average. Although considered as part of the Northwestern Alaska waterfowl range these two areas more closely resemble Interior conditions.

Breeding waterfowl density on the Yukon-Kuskokwim Delta is 14 percent lower than in 1951 but approximately the same as the 4-year average. Transects in the goose concentration also showed a density slightly under the 138 per square mile in 1951. A new transect this year in another coastal goose concentration supported a density of slightly more than 500 brant to the square mile plus a few cacklers.

In the Interior, surveys last year and this year, disclose the Fort Yukon Flats as one of the major waterfowl-production areas. Additional surveys including banding and nesting studies are tentatively planned for this area in 1953. Minto Lakes, Fort Yukon and Tangle Lakes, population densities are materially higher than 1951, while the Northway-Tetlin density was slightly lower. Long-term averages are not available for comparison on these areas, in contrast to western Alaska where the transects were started in 1949.

The only important Gulf of Alaska coastal area sampled was the Copper River Flats where the breeding population was materially higher than in 1951. Some of this increase may be attributable to improved technique and experience on these transects first flown last year, the earlier survey dates may also be a factor.

Although detailed nesting studies were not possible this year, the mid-summer ground work in connection with banding operations on the Yukon Delta, Minto Lakes and Copper River Flats indicates normal production. Gull predation continued heavy on the Yukon Delta goslings and apparently intestinal parasites are a more important factor on the concentrated goose grounds than previously realized. The threats of wide-spread nest flooding on coastal areas was graphically illustrated by a combination on-shore wind and high tide this summer on Yukon Delta; fortunately nesting was completed and no harm resulted.

Because of the large size of Alaska and the dissimilar waterfowl habitats it seems desirable to segregate future reports into three or more parts: (1) Bering Sea, Arctic and Aleutian coastal areas; (2) Interior Alaska and (3) Prince William Sound and Southeast Alaska. Also improved sampling methods should be tried in order to increase reliability of the transects as population trend indices. The Fort Yukon Flats should be included in the summer nesting and banding studies.

Summary of Summer's Banding Operations

Table VII I summarizes Alaska banding at the four locations described earlier in this report.

Table VIII - Birds Banded in Alaska

Species	ADULTS			IMMATURE			
	Sex			Sex			
	Male	Female	Unknown	Male	Female	Unknown	Total
Geese, brant, swan							
Western Canada geese	4	3	9	26	26	80	148
Cackling geese	188	255	2	270	295	1	1,011
White-fronted geese	3	13	-	13	12	3	44
Emperor geese	-	2	-	29	22	-	53
Black brant	137	147	464	389	405	820 *	2,362
Whistling swan	2	1	-	-	2	-	5
Total							3,623
Ducks							
Pintail	63	4	-	10	5	1	83
Mallard	6	-	-	2	2	1	11
Shoveler	-	-	-	2	5	-	7
Baldpate	1	-	-	2	3	-	6
Gadwall	1	-	-	-	-	-	1
Green-winged teal	-	1	-	1	2	-	4
Canvasback	-	-	-	2	2	-	4
Greater scaup	-	2	-	8	7	-	17
Lesser scaup	2	6	-	54	41	-	103
Scaup-Unidentified	-	1	-	1	7	-	9
Old squaw	-	1	-	-	-	-	1
Goldeneye	1	1	-	-	-	-	2
American scoter	-	1	-	-	-	-	1
Bufflehead	9	3	-	-	-	-	12
Spectacled eider	-	1	-	4	10	-	15
Total ducks							276
Total other birds							30
Total waterfowl and other							3,929

* Includes 39 unknown sex and age, and 26 recaptures.

WATERFOWL BREEDING GROUND SURVEY IN NORTHERN ALBERTA, THE NORTHWEST TERRITORIES, AND THE YUKON

1952

Robert H. Smith and Everett L. Sutton

Introduction

This report covers the fifth consecutive aerial survey of waterfowl populations in Northern Alberta, parts of the Northwest Territories and northern Yukon. It also marks our second appraisal of waterfowl production over the same areas on which population surveys were made. As the surveys have been conducted on approximately the same dates from year to year, over the same areas, and in the same manner, we feel that the figures obtained constitute a reliable index in population fluctuations of the areas sampled.

The writers, accompanied by David A. Munro, began the population surveys on June 6, with flights over the Lake Claire-Athabaska marshes. This phase of the work was concluded on the Mackenzie Delta near Aklavik, Northwest Territories on June 21. Production surveys were begun by the writers on July 6, sampling the same areas as in the population surveys and were concluded on July 20. Following this an exploratory flight was made over Banks Island to check on the numbers and distribution of snow geese previously reported by Eskimos, after which the surveys were concluded at Coppermine, Northwest Territories, on July 31.

Methods Used in Sampling and Areas Covered

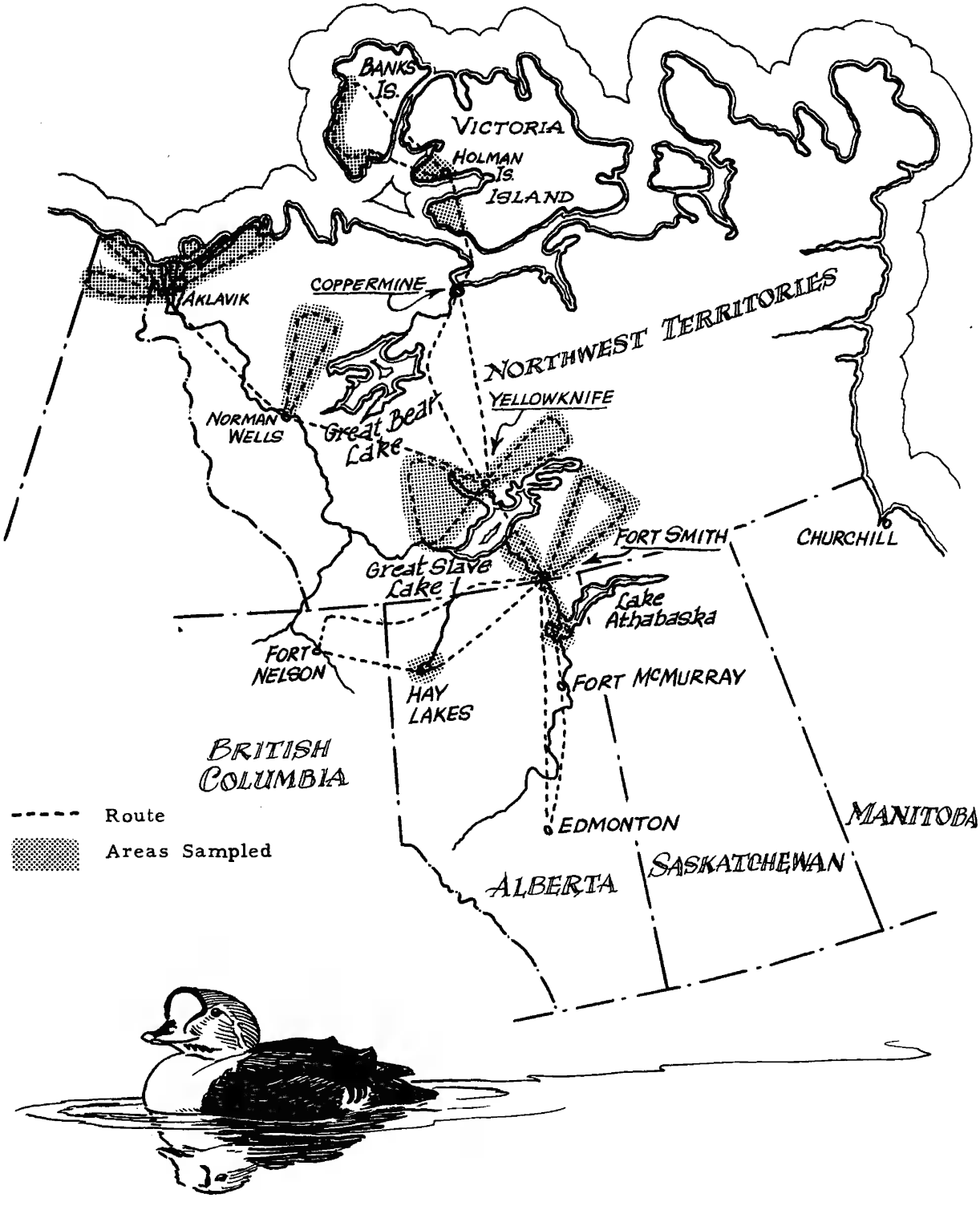
The techniques used in the surveys have not changed since they were begun in 1948. In the population surveys all waterfowl are recorded by species on 1/8-mile strips on each side of an aircraft flying at approximately 100 feet above the terrain on random transects over established sample areas. The production surveys are conducted similarly except that the strip is reduced to 1/16-mile and no attempt is made to separate the broods as to species.

The accompanying map shows the routes flown and areas sampled. Banks Island was covered partially for the first time as was a portion of western Victoria Island. The latter area was rocky, rugged and practically destitute of waterfowl while Banks Island was quite rich by comparison.

Unfortunately we were unable to make a complete survey of Banks Island, as fog lay in patches over some of the most important areas. However, judging from what we were able to cover it appeared that the island is relatively high and rolling on the south and east, and dips gradually to a low coastal plain on the west. Drainage is mostly to the west, the rivers and creeks following typically braided channels and occupy relatively broad valleys.

The coastal plain on the west and adjacent stream valleys contain numerous shallow lakes and ponds which constitutes the principal waterfowl habitat on the island. In a relatively small section of this (all that we could cover due to weather)

BREEDING GROUND SURVEY IN NORTHWESTERN CANADA



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we encountered an estimated 15,000 snow geese. These occured in groups up to 250 in number and were composed of flying adults, flightless adults and adults with young. The proportion of young seemed to be quite high so apparently the hatch had been successful. In addition to snow geese we saw a few small flocks of adult black brant, a few pairs of swan, scattered eiders and old squaws and two pairs of little brown cranes. A few dark geese were seen but were not positively identified.

Weather and Water Conditions

A particularly early and dry season prevailed in northern Alberta and the Northwest Territories north to approximately 63 degrees latitude. North of 63 degrees the ice in the lakes was persistent until the latter part of June. However, an unusually warm summer helped counteract this and the ice had completely disappeared by mid-July, which is earlier than normal. A severe storm brought snow along the Arctic coast on July 25, and on July 30 salt water was freezing between the ice pans at Holman Island.

The Slave River Parklands, bordering the Slave River between Lake Athabaska and Great Slave Lake, was the only area where surface water was visibly reduced by the drought. All other areas appeared to have a normal distribution of surface water.

Breeding Population Trends

The transect sample figures for which there are comparative data are listed in the following tables:

Table I - Lake Claire - Athabaska Delta, Alberta *

	1948	1949	1950	1951	1952
Ducks per square mile	41	177.4	66.4	37.1	57.8
Est. breeding pop. index	53,300	230,620	86,320	48,230	75,140
% change from former years		+ 333	-62.6	- 44	+ 56

Percent Species Composition, 1952

Species	Percent	Species	Percent
Mallard	44.9	Canvasback	2.3
Pintail	19.3	Blue-winged teal	1.4
Scaup	10.1	Bufflehead	1.2
Baldpate	6.5	Scoters	0.9
Shoveler	4.4	Gadwall	0.6
Goldeneye	3.9	Ruddy	0.4
Redhead	3.7	Green-winged teal	0.4

* Estimated area 1,300 square miles.

Table II - Hay Lakes, Alberta *

	1950	1951	1952
Ducks per square mile	124.6	84.3	243.7
Percent change from former years		- 32	+ 189

Percent Species Composition, 1952

Species	Percent	Species	Percent
Mallard	19.3	Baldpate	8.3
Pintail	17.7	Redhead	6.5
Scaup	12.8	Shoveler	3.9
Canvasback	11.9	Green-winged teal	0.5
Goldeneye	10.0	Scoters	0.5
Bufflehead	8.6		

* Area unknown.

Table III - Slave River Parklands, N. W. T. *

	1948	1949	1950	1951	1952
Ducks per square mile	4.3	6.8	5.7	7.7	3.4
Est. duck breeding pop. index	21,500	34,000	28,500	38,500	16,800
% change from former years		+ 58	- 16	+ 29	- 56
Canada geese per square mile	-	-	-	.06	-
Est. goose breeding pop. index	-	-	-	300	-

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scaup	35.7	Bufflehead	7.1
Mallard	21.4	Scoters	4.8
Green-winged teal	16.7	Unidentified	4.8
Baldpate	9.5		

* Estimated area 5,000 square miles.

Table IV - Pre-Cambrian - Hudsonian Zone, N. W. T. *

	1949	1950	1951	1952
Ducks per square mile	11.6	14.7	10.0	11.3
Percent change from former years		+ 27	- 32	+ 13

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scaup	57.7	Bufflehead	1.1
Scoters	33.2	Goldeneye	0.5
Mergansers	5.7	Old squaw	0.5
Baldpate	1.1		

* Area unknown

Table V - Lac La Martre - Willow Lake Area, N. W. T. *

	1949	1950	1951	1952
Ducks per square mile	5.7	9.3	7.1	11.8
Est. duck breeding pop. index	85,500	139,500	106,500	177,000
% change from previous year		+ 63	- 24	+ 66
Canada geese per square mile	.26	1.2	0.7	0.93
Est. goose breeding pop. index	3,900	18,000	10,500	13,950
% change from previous year		+ 362	- 42	+ 33

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scoters	26.5	Shoveler	2.9
Scaup	25.6	Goldeneye	2.6
Pintail	24.1	Bufflehead	2.6
Mallard	7.6	Old squaw	1.8
Baldpate	5.6	Green-winged teal	0.7

* Estimated area 15,000 square miles.

Table VI - Fort Rae - Gros Cap- East of North Arm, Great Slave Lake, N. W. T. *

	1950	1951	1952
Ducks per square mile	29.4	27.5	26.1
Percent change from previous year		-6.5	- 5

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scaup	74.7	Baldpate	2.7
Scoters	8.8	Green-winged teal	0.9
Bufflehead	4.6	Merganser	0.9
Mallard	3.5	Old squaw	0.6
Pintail	3.3		

* Area unknown.

Table VII.- Wooded Delta Mackenzie River, N. W. T. *

	1948	1949	1950	1951	1952
Ducks per square mile	27.7	31.8	21.2	26.7	32.7
Est. breeding pop. index	99,720	114,480	76,320	96,120	117,720
% change from previous year		+ 15	- 33	+ 26	+ 22
Swans per square mile	1.5	.04	1.7	.23	.19
Est. breeding pop. index	5,400	144	6,120	828	684
% change from previous year		- 97	+ 325	- 86	- 17.4

* Estimated area 3,600 square miles.

Table VII - Wooded Delta Mackenzie River, N. W. T. (continued)

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scoters	40.6	Mergansers	2.2
Scaup	35.6	Old squaw	1.9
Mallard	5.3	Canvasback	1.2
Baldpate	4.7	Green-winged teal	1.0
Pintail	3.9	Bufflehead	trace
Goldeneye	3.6		

Table VIII - Treeless Delta Mackenzie River, N. W. T. *

	1948	1949	1950	1951	1952
Ducks per square mile	25.2	38.1	43.4	26.0	14.1
Est. breeding pop. index	40,320	60,960	69,440	41,600	22,560
% change from previous year		+ 51	+ 14	- 40	- 45
Swans per square mile	1.4	0.9	0.8	3.2	1.4
Est. breeding pop. index	2,240	1,440	1,280	5,120	2,240
% change from previous year		- 36	- 11	+ 300	- 56
Canada geese per square mile	.03	.03	.01	.07	1.2
Est. breeding pop. index	48	48	16	112	1,920
% change from previous year	-	-	- 67	+ 600	+1,700
White-fronted geese per sq. mile	.06	.04	.02	0.3	0.5
Est. breeding pop. index	96	64	32	480	800
% change from previous year		- 33	- 50	+1,400	+ 66

Percent Species Composition, 1952

Species	Percent	Species	Percent
Pintail	61.4	Baldpate	5.1
Scoter	11.0	Old squaw	5.0
Scaup	9.1	Merganser	0.4
Mallard	7.8	Shoveler	0.2

* Est. area 1,600 square miles.

Table IX - Upland Tundra between Mackenzie and Anderson Rivers, N. W. T. *

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scoters	51.3	Baldpate	2.0
Old squaw	24.1	Merganser	0.1
Scaup	13.5	Mallard	0.1
Pintail	8.9		

* Estimated area 5,300 square miles.

(continued)

Table IX - Upland Tundra between Mackenzie and Anderson Rivers, N. W. T.

	1948	1949	1950	1951	1952
Ducks per square mile	35.4	32.6	32.8	46.2	17.5
Est. breeding pop. index	187,620	172,780	173,840	244,860	92,750
% change from previous year		- 8	+ 1	+ 41	- 62.1
Swans per square mile	1.2	1.0	1.0	2.8	.77
Est. breeding pop. index	6,360	5,300	5,300	14,840	4,080
% change from previous year		- 17	n.c.	+ 180	-72.5
Canada geese per square mile	.5	-	.04	.4	-
Est. breeding pop. index	2,650	-	212	2,120	-
% change from previous year		-100	+ inf.	+1,000	-100
White-fronted geese per sq. mile	1.9	.7	2.5	1.5	1.1
Est. breeding pop. index	10,070	3,710	13,250	7,950	5,724
% change from previous year		- 63	+ 257	- 40	- 28

Table X - Coastal Tundra between Mackenzie and Anderson Rivers, N. W. T. *

	1948	1949	1950	1951	1952
Ducks per square mile	11.5	12.4	17.0	11.3	13.5
Est. breeding pop. index	10,350	11,160	15,300	10,170	12,105
% change from previous year		+ 8	+ 37	- 34	+ 16
Swans per square mile	1.6	1.7	1.8	1.3	2.3
Est. breeding pop. index	1,440	1,530	1,620	1,170	2,070
% change from previous year		+ 6	+ 6	- 28	+ 77
White-fronted geese per sq. mile	2.0	0.3	2.5	0.5	1.2
Est. breeding pop. index	1,800	270	2,250	450	1,080
% change from previous year		- 85	+733	- 80	+140

Percent Species Composition, 1952

Species	Percent	Species	Percent
Old squaw	44.6	Pintail	11.2
King eider	28.6	Scaup	3.0
Scoters	12.6		

* Estimated area 900 square miles.

Table XI - Transition Zone between Mackenzie and Anderson Rivers, N. W. T. *

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scoters	52.3	Pintail	2.4
Scaup	32.8	Mergansers	1.0
Old squaw	8.4	Mallard	0.4
Baldpate	2.7		

* Estimated area 2,500 square miles.

(continued)

Table XI - Transition Zone between Mackenzie and Anderson Rivers, N. W. T.

	1948	1949	1950	1951	1952
Ducks per square mile	12.4	8.9	13.2	17.0	25.6
Est. breeding pop. index	31,000	22,250	33,000	42,500	64,000
% change from previous year		- 28	+ 48	+ 29	+50.6
Swans per square mile	.3	.4	.2	.3	.8
Est. breeding pop. index	750	1,000	500	750	2,000
% change from previous year		+ 33	- 50	+ 50	+ 167
Canada geese per square mile	-	-	-	.13	.1
Est. breeding pop. index	-	-	-	325	250
% change from previous year		-	-	-	- 23

Table XII - Old Crow Flats, Yukon Territory *

	1948	1949	1950	1951	1952
Ducks per square mile	56.2	38.0	43.0	71.1	65.5
Est. breeding pop. index	112,400	76,000	86,000	142,200	131,000
% change from previous year		- 32	+ 13	+ 65	- 8
Swans per square mile	-	-	-	.12	0.1
Est. breeding pop. index	-	-	-	240	200
% change from previous year		-	-	-	- 17
Geese per square mile	2.4	2.2	1.8	.43	.33
Est. breeding pop. index	4,800	4,400	3,600	860	660
% change from previous year		- 8	- 18	- 76	- 23

Percent Species Composition, 1952

Species	Percent	Species	Percent
Scoters	51.3	Baldpate	2.0
Old squaw	24.1	Merganser	0.1
Scaup	13.5	Mallard	0.1
Pintail	8.9		

* Estimated area 2,000 square miles.

Table XIII - Brant and Goose Populations on the Deltas of the Mackenzie, Kugaluk and Anderson Rivers, and Cape Dalhousie

	1948	1949	1950	1951	1952
Snow geese	7,320	2,943	5,390	7,360	9,489
Black brant	2,377	2,510	2,004	1,294	3,147
White-fronted geese	901	825	1,112	120	8
Canada geese	596	567	62	-	-

Success of the Season

The results of the production survey, expressed in broods per square mile, are given in the following table.

Table XIV - Broods per Square Mile Observed on the Areas Covered

	DUCKS		SWAN		GEESE	
	1951	1952	1951	1952	1951	1952
Lake Claire - Athabaska Delta	0.5	2.07	-	-	-	-
Hay Lakes	0.7	3.53	-	-	-	-
Slave River Parklands	0.2	1.0	-	-	-	.05
Pre-Cambrian	.07	.33	-	-	-	-
Lac La Martre	0.4	1.0	-	-	-	0.3
Fort Rae - Gros Cap	0.3	1.0	-	-	-	-
Wooded Delta	1.1	2.0	-	-	-	-
Treeless Delta	0.0	0.4	0.1	0.2	-	.07
Upland Tundra	.14	.15	0.3	0.3	-	.05
Coastal Tundra	0.0	0.9	0.8	0.5	-	-
Transition Zone	.13	.66	.13	.07	.03	-
Old Crow Flats	1.1	.73	.07	-	.07	-

The above figures indicate an increase in duck production in all areas except Old Crow, an over-all increase of 133 percent. We feel, however, that the indicated increase is a manifestation of the early season, rather than an actual increase of such magnitude. The season, with minor exceptions, was favorable as far as weather was concerned. Consequently the hatch was at least earlier, and possibly greater.

Snow goose and brant production on the outer deltas of the Mackenzie and Anderson Rivers was a complete failure. Possibly storm tides washed out the nests, although a storm of such magnitude was not reported. In any event the nesting and brooding areas were practically abandoned at the time of our brood survey in July. Conversely, the hatch of snow geese on Banks Island appeared to be good, but then the Banks Island area would not be affected by storm tides. Goose production as recorded by transects on sample areas was considerably greater than in 1951, as goose broods were recorded from areas where they had not been seen previously.

Summary

All areas considered together, the breeding population of ducks decreased slightly - 8 percent from 1951. Broken down by species, increases were as follows: pintail, 21 percent; shoveler, 149 percent; blue-winged teal, 118 percent; canvasback, 55 percent; ruddy duck, 183 percent; bufflehead, 20 percent; King eider, 48 percent. The following species decreased: baldpate, 3 percent; gadwall, 23 percent; green-winged teal, 34 percent; scaup, 8 percent; redhead, 26 percent; goldeneye, 7 percent; old squaw, 9 percent; scoters, 20 percent. There was no appreciable change in mallards. It should be pointed out that we

are measuring shovelers, canvasback, redheads, blue-winged teal, gadwall and ruddy ducks on the edge of their ranges, so the percentages recorded are not especially significant for these species.

The brood surveys indicated production was up 133 percent, but we feel that this indicated increase was due in large measure to an earlier season than in 1951.

Snow geese and black brant breeding populations on comparable areas were up 29 percent and 143 percent respectively, but production was completely wiped out on the sample areas. The hatch of snow geese on Banks Island, however, appeared to be good. Canada geese increased 39 percent on sample areas and production increased considerably. Breeding populations of white-fronted geese decreased 14 percent on tundra transects with little or no production being recorded.

WATERFOWL BREEDING GROUND SURVEY IN BRITISH COLUMBIA

R. H. Mackay

Introduction

Ground and aerial surveys of waterfowl breeding areas, comparable to those made in previous years, were carried out in British Columbia in 1952. Robert H. Smith, assisted by the author, covered the upper Columbia Valley, Cariboo, Chilcotin and Prince George regions in a U. S. Fish and Wildlife Service aircraft. Aerial reconnaissance of waterfowl habitat in the region adjacent to Fort St. John, on the Queen Charlotte Islands and on the northern extremity of Vancouver Island was made in addition to the transects established in past years. Ground surveys in the upper Columbia Valley, Okanagan, Kamloops and Cariboo areas were made by D. A. Munro and the author. Banding operations were carried out for the fifth consecutive year in the Chilcotin, Cariboo and Kamloops regions by a party employed by the British Columbia Game Commission.

Methods

Total counts of selected sample sloughs and lakes in the best areas of waterfowl productivity in the Province again constituted the ground survey. Comparative data obtained in this manner are now available over a period of 6-years for the Cariboo, 5-years for the upper Columbia Valley, and 3-years for the Okanagan regions.

An aerial survey of the Rocky Mountain Trench from Cranbrook north to Golden was carried out again this year. This area lends itself well to aerial survey as it is possible to make a total count by flying up one side of the valley and down the other. Comparable aerial counts for this region over a 3-year period are now available.

Random transects in the Cariboo, Chilcotin, and Prince George areas were also surveyed for waterfowl from the air this spring. These areas, being restricted in size, fairly rough in topography, and with an uneven distribution of water do not lend themselves ideally to aerial sampling. Increased coverage would appear to be a solution for more accurate results in this type of habitat, if aerial transects are to be continued.

Weather and Water Conditions

Weather and water conditions were not unusual in British Columbia this season. There were no prolonged hot spells in the spring, and this permitted a gradual run-off. Lakes and sloughs were well filled throughout the summer and conditions appeared favourable to breeding waterfowl.

Breeding Population Trends

The ground survey in the Cariboo Parklands was carried out from May 31 to June 3. The total number of ducks tallied was up slightly (2.7 percent). Mallards were more plentiful - almost twice as many were counted this year as compared to

last year, continuing a gradual increase since 1949. A drop of approximately 15 percent in the number of lesser scaup ducks was recorded. The complete picture of the breeding ground survey in the Cariboo is given in the following table.

Table I - Comparative Counts - Cariboo Parklands - Spring

Species	1946	1947	1949	1950	1951	1952
Whistling swan	-	-	-	-	1	-
Canada goose	-	-	-	-	-	2
Mallard	39	35	10	35	61	107
Pintail	12	15	1	19	10	18
Baldpate	73	56	13	28	53	41
Gadwall	-	-	-	-	-	2
G-w. Teal	7	19	2	5	11	19
B-w. Teal	-	-	-	-	31	12
Shoveler	5	9	2	5	12	15
Redhead	12	28	32	32	37	32
Ringneck	3	7	-	-	2	-
Canvasback	21	17	25	20	31	11
Lesser scaup	403	467	155	476	241	205
Goldeneye	57	116	66	136	142	175
Bufflehead	79	100	30	117	89	95
Ruddy duck	31	42	28	59	92	91
Unidentified	-	-	-	-	-	11
Total ducks	742	901	364	932	812	834
Total Coot	447	167	35	170	154	107

The results of the aerial survey in the Cariboo, Chilcotin, and Prince George regions are given in Tables II, III, and IV.

Table II - Aerial Survey - Cariboo Parklands

	1950	1951	1952
Square miles sampled	25.5	28.4	25.0
Ducks per square mile	11.5	13.5	7.7
Percent Species Composition			
Scaup	35.1	43.1	40.6
Goldeneye	26.7	2.5	9.1
Mallard	18.2	30.2	13.3
Bufflehead	8.4	7.3	20.3
Baldpate	-	6.0	15.4
Canada geese (total seen)	14	14	13

Table III - Aerial Survey - Chilcotin

	1950	1951	1952
Square miles sampled	29.5	30.0	27.5
Ducks per square mile	14.6	19.7	14.9
Percent Species Composition			
Scaup	32.1	24.7	37.7
Scoters	24.3	-	-
Mallard	16.6	24.5	25.6
Pintail	2.3	11.3	6.8
Baldpate	1.3	9.9	14.8
Goldeneye	4.6	8.3	7.1
Canada geese (total seen)	5	18	4

Table IV - Aerial Survey - Prince George

	1950	1951	1952
Square miles sampled	28.3	29.3	22.5
Ducks per square mile	2.1	0.8	2.8
Percent Species Composition			
Scaup	20.0	33.3	34.0
Mallard	18.3	12.5	17.0
Goldeneye	45.0	12.5	27.7
Bufflehead	-	25.0	21.3
Canada geese (total seen)	4	2	-

Data gathered on the ground survey of the upper Columbia Valley in early May are contained in the following table.

Table V - Comparative Counts - Upper Columbia Valley - Spring

Species	1948	1949	1950	1951	1952
Canada goose (nests)	23	17	20	22	18
Mallard	172	87	94	85	62
Pintail	1	3	2	5	2
Baldpate	13	9	6	8	9
G-w. teal	-	4	1	4	2
B-w. teal	4	21	5	6	2
Cinn. teal	2	2	2	-	-
Shoveler	-	-	2	2	3
Wood duck	-	-	4	4	-
Redhead	-	-	2	12	18
Ringneck	13	2	3	1	6
Lesser scaup	-	-	3	13	5
Goldeneye	73	19	47	42	35
Bufflehead	19	14	18	16	8
Ruddy duck	-	-	-	1	9
Hooded merganser	-	-	3	7	-
Total ducks	297	161	192	206	154
Total Coot	84	45	30	50	20

Comparative data gathered during aerial surveys of the upper Columbia Valley are recorded in Table V I. These figures represent approximate total counts for this portion of the Rocky Mountain Trench - about 80 square miles.

Table V I - Aerial Survey - Columbia Valley

	1950	1951	1952
Ducks per square mile	19.9	10.1	12.0
Canada geese per square mile	20.1	17.4	19.7
Canada geese	1,612	1,395	1,575
Swan	2	10	1
Mallard	773	402	445
Baldpate	167	83	155
G-w. teal	24	-	14
B-w. teal	83	7	1
Canvasback	27	3	-
Scaup	18	9	53
Goldeneye	79	97	65
Bufflehead	2	21	9
Others	49	33	88
Unidentified	376	135	130
Total ducks	1,598	790	960

Ground surveys of selected sample areas in the Okanagan Valley, made during early June, are recorded in Table V II.

Table V II - Comparative Counts- Okanagan Valley - Spring

Species	1950	1951	1952
Mallard	45	27	12
Pintail	9	1	-
Baldpate	6	6	3
Gadwall	18	10	13
G-w. teal	3	-	4
B-w. teal	22	3	2
Redhead	86	150	67
Lesser scaup	49	12	7
Goldeneye	4	-	2
Bufflehead	6	-	1
Others	76	19	40
Total ducks	270	179	151
Total Coot	157	70	69

Examination of breeding population data from all the sample areas in the Province showed a small decrease in the number of ducks and a small increase in the number of geese on the breeding grounds.

Table VIII - Summary of Brood Data

Species	1950	1951	1952				
	All Broods	All Broods	0-1 Weeks	1-8 Weeks	8-plus Weeks	Unclassified	All Broods
Mallard	7.5 (50)	6.3 (37)	6.0 (3)	5.0 (4)	4.3 (3)	3.0 (1)	4.9 (11)
Gadwall	5.0 (1)	6.0 (8)	-	8.5 (2)	4.0 (1)	-	7.0 (3)
Pintail	6.3 (22)	4.8 (9)	-	5.0 (3)	-	-	5.0 (3)
G-w. teal	8.6 (8)	7.0 (7)	7.0 (1)	5.0 (4)	-	5.0 (1)	5.3 (6)
B-w. teal	7.9 (20)	7.8 (6)	10.0 (1)	4.0 (1)	-	-	7.0 (2)
Baldpate	7.6 (31)	5.9 (28)	-	5.4 (6)	7.7 (4)	5.3 (3)	6.2 (14)
Shoveler	6.1 (7)	6.4 (8)	-	8.0 (2)	3.0 (1)	-	6.3 (3)
All pond ducks	7.3 (139)	6.1 (103)	7.7 (5)	5.8 (22)	4.8 (9)	4.4 (5)	6.0 (42)
Redhead	5.7 (17)	6.7 (22)	7.0 (1)	6.8 (9)	-	10.0 (3)	7.5 (13)
Canvasback	8.7 (4)	8.4 (10)	6.5 (2)	7.0 (3)	3.0 (1)	-	6.2 (6)
Lesser scaup	8.3 (35)	7.7 (59)	7.4 (18)	8.4 (17)	-	5.7 (6)	7.5 (41)
B. goldeneye	6.5 (87)	6.0 (28)	8.0 (1)	7.0 (4)	-	4.0 (6)	4.8 (11)
Bufflehead	6.6 (27)	5.6 (6)	-	-	-	4.7 (3)	4.7 (3)
Ruddy duck	5.7 (30)	6.2 (17)	5.0 (1)	5.0 (3)	-	3.8 (5)	4.3 (9)
All diving ducks	6.6 (200)	7.0 (142)	6.8 (23)	6.8 (36)	3.0 (1)	5.6 (23)	5.8 (83)
Canada geese	4.9 (28)	5.5 (10)	-	-	-	-	-

Production

Brood averages recorded in Table V I II have again shown a slight decline. However, as it was possible to have only one observer in the field during the production survey, the number of broods tallied this year was down accordingly. This would, no doubt, have some bearing on the average brood size.

Midsummer counts in the Cariboo, Okanagan and Kamloops regions are recorded in Tables IX, X and X I. Due to weather conditions and car trouble, waterfowl information was not obtained from Minnie and Douglas Lakes in the Nicola area this summer. The number of birds known to be on these lakes would increase considerably the figures for 1952 given in Table X.

Consideration of all available data indicates an increase of at least 15 percent in the number of waterfowl produced in British Columbia this year. All species, excepting Barrow's goldeneye which is down slightly, have shown increases to a greater or lesser degree.

Table IX - Midsummer Counts - Cariboo Parklands

	1950		1951		1952	
Species	Adult	Young	Adult	Young	Adult	Young
Unidentified ducks	-	-	-	-	102	7
Mallard	41	24	57	50	129	24
Pintail	29	27	1	-	10	9
Baldpate	52	82	63	67	28	64
Gadwall	-	-	2	16	1	-
G-w. teal	24	30	14	37	28	32
B-w. teal	62	13	6	9	4	14
Shoveler	7	17	1	5	7	21
Redhead	14	24	21	67	10	72
Canvasback	9	25	9	22	35	27
Lesser scaup	222	21	174	293	212	257
Goldeneye	142	169	216	306	239	110
Bufflehead	46	46	42	36	110	68
Ruddy duck	33	6	36	16	89	19
Total ducks	695	484	642	924	1,004	724
American coot	158		369		283	

Table X - Midsummer Counts - Kamloops and Nicola

Species	1950		1951		1952	
	Adult	Young	Adult	Young	Adult	Young
Mallard	297	33	337	71	246	4
Pintail	36	17	49	41	162	-
Baldpate	22	16	11	23	118	4
Gadwall	-	-	1	9	37	-
G-w. teal	12	-	66	6	20	-
B-w. teal	25	17	49	25	51	-
Shoveler	3	14	22	23	119	-
Lesser scaup	713	64	702	158	56	18
Goldeneye	501	33	827	24	566	-
Bufflehead	112	2	189	20	40	-
Ruddy duck	8	37	2	19	52	10
Unidentified ducks	296		298		896	
Total ducks	1,729	233	2,255	419	1,467	36
American coot	14	21	63	49	168	

Table XI - Midsummer Counts - Okanagan

Species	1950		1951		1952	
	Adult	Young	Adult	Young	Adult	Young
Mallard	406	57	298	54	251	
Pintail	34	-	152	10	55	
Baldpate	7	6	15	-	25	
Gadwall	1	-	28	9	2	14
G-w. teal	1	-	35	30	43	
B-w. teal	40	26	32	49	20	
Redhead	50	63	75	37	75	26
Goldeneye	14	8	3	12	2	
Ruddy duck	25	76	37	37	28	13
Other	10	4	14	-	1,215	
Total ducks	588	240	699	246	105 1,611	53
American coot	520		575		852	

Summary

Both aerial and ground waterfowl surveys, comparable with those made in previous years, have been carried out in British Columbia again this year.

Weather and water conditions were once again favourable to waterfowl production.

Although a slight decrease in the breeding population was recorded this spring, midsummer counts showed an over-all increase of at least 15 percent in the number of waterfowl on the sample areas in the Province.

Results of Summer Banding in British Columbia

The number of birds banded by species were:

Mallard	153
Pintail	31
Baldpate	183
Gadwall	43
Green-winged teal	59
Blue-winged teal	20
Redhead	118
Ring-necked duck	13
Canvasback	36
Lesser scaup	603
Common goldeneye	1
Barrow's goldeneye	1,295
Bufflehead	321
White-winged scoter	26
Ruddy duck	16
Red-necked grebe	2
Horned grebe	27
Black-necked grebe	52
American coot	91
Total birds	3,090
Total ducks	2,918

WATERFOWL BREEDING GROUND SURVEY IN ALBERTA

Allen G. Smith

The 1952 Alberta waterfowl survey was conducted with the following objectives in mind: (1) to evaluate the waterfowl breeding ground conditions in southern and central Alberta; (2) to appraise the breeding population and its species composition; (3) to evaluate the production of this population; and, (4) by the introduction of intensive ground study areas, to keep abreast of changing events in the waterfowl picture from the arrival of the ducks on the breeding grounds until the young of the year become airborne. The results of the intensive ground studies are contained in a separate report.

Aerial breeding population and production surveys were made with a Piper PA 18 - Super Cub, piloted by G. H. Jensen, with Allen G. Smith as observer. Three intensive ground study areas were under constant observation and study throughout the summer - Areas 1 and 2 by Donald B. Reid, Canadian Wildlife Service and John Stelfox, Alberta Game Branch; and Area 3 by Wayne H. Heuer, U. S. Fish and Wildlife Service. Two other areas (Areas 4 and 5) were studied by Fred Sharpe and George Freeman, biologists for Ducks Unlimited (Canada) with the express purpose of comparing ground observations of breeding populations and broods with aerial surveys in an attempt to arrive at a factor of error in aerial methods. The same objective held for Areas 1, 2 and 3, but the men making the investigations were able to extend their studies to include periodic checks of breeding populations, nesting and brood studies, and habitat evaluations.

Survey Methods

For 4 years, data have been obtained on breeding populations and brood counts in Alberta by the use of both aerial and ground surveys. As the primary purpose of these surveys has been to measure the Provincial waterfowl populations and their production, and as it has been found that this data can be gathered far more quickly and economically by aerial means, further duplication of effort by ground crews has been discontinued. Therefore, with the abandonment of ground transects this year, intensive ground studies of selected areas were substituted as a means of providing us with data unobtainable from the air.

Alberta's major waterfowl producing areas have been divided into 4 ecological strata: Strata A, the prairies of southcentral Alberta; Strata B, the parklands; Strata C, the semi-arid southern short-grass prairie; and Strata D, the closed forests. Strata C, which occurs in greater acreage in Saskatchewan than in Alberta, is contiguous to that same strata in Saskatchewan and, for reasons of convenience was surveyed aerially from Saskatchewan by John J. Lynch, U. S. Fish and Wildlife Service. The data obtained by Lynch is included in this report. Strata A contains 13 parallel transects at intervals of 10 miles, extending from Alberta Highway No. 2 to the Saskatchewan border. Strata B contains 10 parallel transects at 12-mile intervals and Strata C, 4 parallel transects at 15-mile intervals. Exploratory transects were laid out in the closed forest but only 2 of these proved to be practical as far as either water or waterfowl were concerned. Parallel transects were flown from the International Border to parallel 54 degrees,

while exploratory northern transects extended to approximately parallel 55 degrees, 30 minutes. Aerial breeding population transects were flown from May 5 to May 25 (70 flying hours) and production transects from July 2 to July 15 (56 flying hours). Population transects were of 1/4-mile width and production transects were 1/8-mile in width as in former years. Water areas, species and sex of waterfowl were recorded in May, species and sex of adult waterfowl as well as species of broods and their age classification were obtained in the July flights.

Weather and Water Conditions

An early break-up and a good runoff in 1952 combined with the high water levels and excellent soil moisture storage of 1951 to create excellent conditions on the Alberta breeding grounds this spring. The month of April brought record-breaking warm temperatures. Despite the retarded spring in northern United States, waterfowl moved into Alberta in early April and as the break-up occurred simultaneously in southern and central areas of the Province, early nesting began prior to the middle of April throughout the entire area of study. May was generally a dry month, but sufficient rains fell after May 15 and throughout June and July to bring water levels above May records in many places. Sub-surface conditions were excellent throughout the summer. As of May 5, Alberta's total moisture condition was 122 percent of normal, by August this had deteriorated slightly to 115 percent. Agricultural activities, especially on last year's stubble, was delayed in much of the Province by rainfall in late May and throughout June. This fact, plus the excellent condition of the waterfowl habitats, worked to the distinct advantage of nesting ducks. The combination of these circumstances assured a more successful first nesting attempt and contributed immeasurably to a highly successful waterfowl season.

Though aerial transects in May showed a reduction of 18.8 percent in water areas from last year's figure, this actually reflected a more healthy condition than was apparent at first glance. At no time during the flights in May did we record any D areas (sheet water or water of extreme temporary nature). The warm temperatures and drying winds of April and early May had resulted in the disappearance of this type of water. Thus the predominant available water areas throughout the Province at the beginning of the breeding season were either Class A, B or C. (This, in itself, was of greater advantage to waterfowl selecting their nesting sites.)

In May of 1951, the aerial transects showed a Provincial average of 21.68 ponds per square mile. The 1952 survey tallied 17.15 ponds per square mile. This is a loss of 4.53 ponds per square mile or a decrease of 20.9 percent over the 1951 figure.

During the aerial brood survey in July a loss of 26.4 percent in water areas present in May was recorded. The rains which fell in late May, June and July are reflected in the greater stability of water in late summer this year. Even in a year as wet as 1951, a 36.5 percent loss in water areas occurred between May and July.

Table I - Water Areas on Aerial Transects, May and July, 1952

Strata	Total Ponds Seen	Ponds per Sq. Mile	Size of Strata Square Miles	Est. Total Ponds	Percent Change May to July
A - May	4,378	18.18	22,088	401,560	- 26.40
- July	3,222	13.38	22,088	295,537	
B - May	3,782	21.69	26,100	566,109	- 30.15
- July	2,642	15.15	26,100	395,415	
C - May	694	8.40	16,112	135,341	- 10.50
- July	621	7.52	16,112	121,162	
Province					
- May	-	17.15	64,300	1,103,010	- 26.40
- July	-	12.63	64,300	812,114	

Breeding Population Trends - Aerial Data

For the second year in succession, a very appreciable increase in the breeding population of waterfowl has been recorded on our aerial transects in Alberta. The approximate 50 percent increase of the 1951 populations over those of 1950 was actually a return to more normal conditions following a 2-year period of severe drought and low population densities. A 21.4 percent increase in 1952 over 1951 represents a far more significant figure.

Table II - Aerial Waterfowl Population Data

Strata	Survey Area Sq. Mi.	Sample Area Sq. Mile	Total Ducks Seen	Ducks per Sq. Mi.	Population Index	Percent Change 1951 to 1952
A - 1951	22,088	516.0	12,115	23.47	518,405	+ 16.9
- 1952	22,088	481.4	13,316	27.45	606,316	
B - 1951	26,100	236.6	3,706	15.66	408,726	+ 12.1
- 1952	26,100	348.6	6,124	17.56	458,316	
C - 1951	16,112	228.2	2,382	10.43	168,048	+ 57.5
- 1952	16,112	165.2	2,714	16.43	264,720	
Province						
- 1951	64,300	-	-	17.03	1,095,179	+ 21.4
- 1952	64,300	-	-	20.67	1,329,352	

In former years population indices for Alberta have always been computed on the basis of birds actually observed. In order to arrive at a closer approximation of the true population, the indicated figure will be used in the future for comparisons. This figure is obtained by crediting each lone male seen on a transect with a female. (See Table 3.)

Table III - Adjusted or Indicated Waterfowl Population - 1952 *

	Total Ducks Observed	Ducks per Sq. Mi.	Total Ducks Indicated	Total Ducks Indicated Per Sq. Mi.	Population Index
Strata A	13,316	27.45	21,055	43.73	965,908
Strata B	6,124	17.56	9,584	27.49	717,489
Strata C	2,714	16.43	4,334	26.24	422,779
Province		20.67		32.76	2,106,176

* Lone males credited with female.

Success of the Season - Aerial Data

The 1952 breeding season began with an observed 21.4 percent increase in the breeding stock over that present in 1951. These birds succeeded in bringing off an excellent first hatch, which registered an 86.7 percent increase in broods observed this year. On Stratas A and C, which together composed the prairie in our former reports, an average of 1.80 broods per square mile were observed in 1951. This year, Strata C which makes up the dry southern prairie, had 4.0 broods per square mile, and Strata A, the more moist prairie of central Alberta registered 5.1 broods per square mile, an average of 4.6 broods per square mile. This means that for the second year an outstanding increase in production has occurred on the prairies. In 1951 this increase was 211 percent over that of the drought year 1950, while in 1952 it becomes a 157.9 percent increase over the 1951 figure. In the parklands, where observations from a plane are poor as compared to the open prairie, the ability to see broods each year varies with the density of the emergent vegetation. Last year, emergent vegetation was sparse because of the recent flooding of formerly dry potholes. This year, the second successive one of high water levels, the vegetation had established itself to a degree where the bulk of the smaller areas were completely choked and brood observation was very difficult from the air. In spite of this fact, we still found an increase from 2.37 broods per square mile to 2.55 broods per square mile or an upward trend of 7.6 percent.

The drought years (1949-1950) led to a severe decline in the population of pintails on the Alberta prairies. The pintail, primarily a prairie nesting bird, does not appear to be able to adjust itself to nesting in forested areas as does the mallard. Therefore, a decline in pintail numbers occurred in 1949 and 1950 which saw the rise of the mallard to a predominance which made it the most common waterfowl species in the Province. As shown in Table VI, 1952 marks the return of the pintail to its former prominence as a major factor in Alberta waterfowl production.

Table IV - Aerial Production Data -- 1951-1952

	STRATA A (Prairie)		STRATA C (Short Grass Prairie)		STRATA B (Parklands)		PROVINCE	
	1951	1952	1951	1952	1951	1952	1951	1952
Survey Area Square Miles	22,088	22,088	16,112	16,112	26,100	26,100	64,300	64,300
Sample Area Square miles	266.31	240.7	114.12	82.57	118.31	174.3	--	--
Total Broods Seen	718	1,231	67	331	281	445	--	--
Broods per Sq. Mi.	2.69	5.11	.58	4.00	2.37	2.55	2.03	3.79
Est. Number of Broods	59,417	112,870	9,345	64,448	61,857	66,555	130,619	243,873
Average Brood Size (from ground check)	6.38	6.81	6.38	6.81	7.12	6.81	6.73	6.81
Est. Number of Ducklings	379,080	768,645	59,621	438,891	440,422	453,240	879,123	1,660,776

Strata A and C together make up all prairie.

Table V - Population and Production Comparisons -- 1951-1952

	Population Per Square Mile		Percent	Broods Per Square Mile		Percent
	1951	1952	Increase	1951	1952	Increase
Strata A	23.47	27.45	16.9	2.69	5.11	89.9
Strata B	15.66	17.56	12.1	2.37	2.55	7.6
Strata C	10.43	16.43	57.5	.58	4.00	589.6
Province	17.03	20.67	21.4	2.03	3.79	86.7

Table V I - Mallard-Pintail Brood Relationships, 1948-1952

Species	1948	1949	1950	1951	1952
Percent Mallard	24	43	69	40	27
Percent Pintail	76	57	31	60	73
Total	100	100	100	100	100

Summary

The 1952 Alberta waterfowl breeding season has been an outstanding success. An excellent moisture hold-over from 1951, plentiful precipitation during the summer months, and an increased waterfowl breeding population have combined with reduced agricultural activity during the critical nesting period to provide an excellent waterfowl crop. Breeding populations increased about 21 percent over 1951 figures and Provincial production increased about 87 percent. The prairies invariably raise the greatest crop of waterfowl if moisture conditions are at all favorable. This year the semi-arid southern prairies raised nearly 6 times more broods than a year ago and the total prairie production rose 158 percent.

Improvements in field methods and techniques since our initial surveys in 1947, leads us to believe that 1952 has been a more successful season than any year in the last six. Production surveys have been accentuated in the last 2 years which makes our recent data of greater value and reliability than that obtained in 1948, the only year in the past six when waterfowl populations compare favorably with those in 1952.

WATERFOWL BREEDING GROUND SURVEY IN SASKATCHEWAN

J. B. Gollop, John J. Lynch and William Hyska

This report covers the aerial work of the waterfowl breeding ground survey in that part of Saskatchewan lying south of 54° degrees N, and a summary of the achievements of the banding crew for 1952. Reports covering special ground study areas and the Saskatchewan River Delta are to be found elsewhere. The aerial work consisted of two phases as in the past -- a coverage in May to determine the breeding pair population and a coverage in July to determine production.

In May, John J. Lynch, U. S. Fish and Wildlife Service, with William Hyska, Provincial Game Branch as observer, flew 75 air-hours to cover 3,800 linear miles of transect in a Piper Cub, N 724. Joe Perroux and Arthur Hawkins also flew 20 hours, covering 1,200 miles in a Piper Cub, N 735, in Saskatchewan. In July, Lynch and Hyska were assisted by Edward Wellein, U. S. Fish and Wildlife Service, and Dave Colls, Canadian Wildlife Service, in Grumman Widgeon N 728, in covering the same sample (cf. Map).

The banding crew under Floyd Thompson, Game Management Agent, was composed of Kenard Baer and Don Krieble, Game Management Agents, U. S. Fish and Wildlife Service, Duncan Simmonds and Wayne Ferrie, Provincial Game Branch. Bob Caldwell, Ducks Unlimited, and Bernard Gollop, Canadian Wildlife Service also assisted.

Methods

This year, for the first time, Provincial waterfowl trends were measured solely by aerial survey methods; there was no ground survey as in past years to compare with it. Ground work instead was concentrated on four study areas for the purpose of getting ground-to-air comparisons in various types of habitat and for investigating special problems. Three aerial coverages were given each of these areas.

The 4 strata (based on waterfowl densities) established last year were again the basis for aerial work in 1952. Stratum "C" and Stratum "D" (Saskatchewan River Delta, not marked on map) remained as in 1951 but some revision was made between Strata "A" and "B" and the north country. The only significant change involved the addition of about 2,500 square miles to Stratum "A" at the expense of "B". The 9 short north-south transect lines flown last year were dropped and only east-west lines were used. A more satisfactory distribution of the sample was also established (cf. map).

As in the past, a 1/4-mile wide strip was used for the breeding pair survey and a 1/8-mile strip for brood survey. In addition to identifying a portion of the ducks seen and recording lone drakes, the air crew this year also attempted to identify broods.

Weather and Water

Late summer rains in 1951 and winter snows resulted in precipitation readings of 50 to 70 percent above normal through most of the agricultural area of Saskatchewan. A large percentage of the crop over-wintered in the field and in April the way was quickly paved for the "greatest spring harvest in history". Mean temperatures for that month were 6 to 12 degrees above normal while the average precipitation was 0.12 inches, a deficiency of approximately 85 percent. Sloughs in the southeast opened late in March; early in April further west. Seeding got under way about the normal time--2 or 3 weeks ahead of 1951. The first mallards and pintails arrived about the same time as last year - the first week in April.

The surface water situation was probably the best in recent years:

May, 1952 - 20.3 ponds per square mile
May, 1951 - 21.7 ponds per square mile

This difference in pond density is primarily due to a shift in aerial sampling intensity from the southcentral and southeastern parts of the survey district with their numerous small ponds to the area further west, with much larger, but less frequent sloughs. The surface water supply this year was greater than last year. Many areas in the western grasslands were flooded for the first time in recent years, while others held water through August for the first time in the memory of many farmers.

Throughout the summer there was adequate rain even in the drought susceptible west. The southeast which appeared to be drying up near the end of May, benefited from high precipitation during June and July. This year's July figure for ponds in the surveyed area represents more surface water than the 1951 figure for the reasons given above.

July, 1952 - 7.5 ponds per square mile
July, 1951 - 7.6 ponds per square mile

As of August 1, ponds were adequate to insure the rearing of all broods then hatched as well as any later broods.

Breeding Population Trends

A summary of the spring survey by strata is to be found in Table I; species composition compared to 1951 is presented in Table III. Chart 1 gives the comparison of significant data with 1951 and 1949 (1950 not comparable because of method for recording observations).

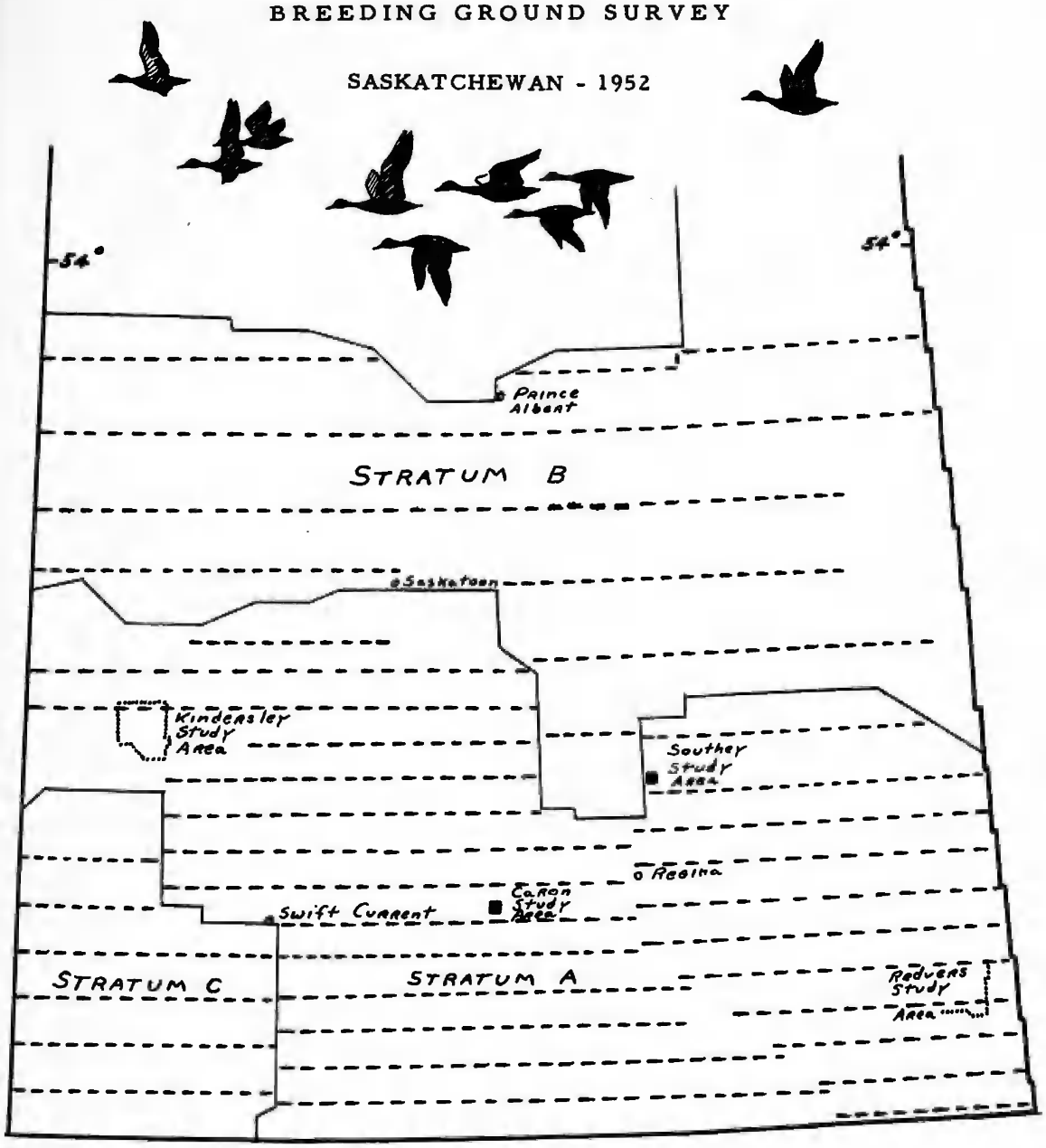
Southern Saskatchewan this spring played host to a waterfowl population more than double that of 1951.

1952 -- 19.25 pairs per square mile (38.5 ducks)
1951 -- 9.35 pairs per square mile (18.7 ducks)

There were 25 mallards and pintails per square mile - more than all species combined last year. However, the aerial data also indicate that each of the other 13 species doubled its population, with the exception of the redhead and gadwall. The species composition of the breeding population is given in Table III.

BREEDING GROUND SURVEY

SASKATCHEWAN - 1952



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The increase may be attributed to the blanket of stubble and swath that presented itself to the birds upon their return -- much of it soaked by newly flooded areas. To some species it represented abundant food; to others it also meant prime nesting cover.

Success of the Season

A summary of the brood survey by strata is to be found in Table II; species composition is presented in Table III. Chart 2 presents the comparison of significant data with 1951 and 1949.

Progress

The advanced state of the first nesting attempt was indicated when at the very start of the May inventory, post nesting flocks of 10 to 15 drakes (mallards and pintails) were noted. On some transects in the southwest over 90 percent of the pintails seen were drakes. Later nesting in the central and northern areas lowered the over-all drake figure to 57.6 percent.

Density

The aerial data indicate that Saskatchewan's doubled breeding population produced more than three times the number of broods recorded in 1951..

1952 - 4.37 broods per square mile
1951 - 1.34 broods per square mile

The success of this year's effort is also emphasized by the ratio of July broods to May pairs:

1952 - 1 brood: 4.4 pairs
1951 - 1 brood: 7.0 pairs

Distribution

Furthermore, there is a better distribution of broods throughout the surveyed area as determined by the number of 10-minute transect intervals in which broods were recorded:

1952 - 82 percent of 363 intervals were occupied
1951 - 70 percent of 253 intervals were occupied

Brood Size and Mortality

	Class I	Class II	Class III	Average	Total Broods
1952 (Air)	7.3	7.1	7.1	7.1	757
1951 (Ground)	6.8	6.2	6.5	6.6	1,037

This year's large brood size probably reflects the success of first attempts, particularly of mallards and pintails, since first clutches usually are larger than those of re-nesters. This, in turn, may suggest unusually light predation in the western grasslands. With near-drought conditions prevailing for the few years previous to 1951, and with a greatly increased water and waterfowl supply this

April, the low resident predator population may have been swamped by the prey species and could not bring in reserves fast enough to hurt the first nests and broods of pintails and mallards, most of which were on the wing by July 15. Agriculture was probably the most serious cause of nest destruction. Some nests in standing and swathed grain that had over-wintered were lost during spring harvest. However, this spring harvesting operation delayed extensive plowing for summer fallow until most stubblefield nests of pintails had hatched.

Brood Maturity

The degree of maturity of the duck crop in July has much bearing on the chances for eventual success of that crop. We accept the number of Class II and III broods seen in the July air survey as evidence of maturity.

1952 - 3.8 Class II and III broods per square mile (88 percent of the total)
1951 - 1.2 Class II and III broods per square mile (90 percent of the total)

Pintail broods were the most advanced: 94 percent of these were in Class III; 14 percent non-flying; 19 percent flying in family groups; 61 percent flying in large flocks. Mallards showed a greater spread in maturity. Class I and II broods predominated among other species with the shoveler most advanced.

Potential Later Broods

We accept lone drakes, single hens, and paired birds on our July transects as evidence of broods to come. Prospects this year were nearly twice as good as 1951.

1952 - 1.2 potential later broods per square mile
1951 - 0.7 potential later broods per square mile

This figure should reflect the success of the normally late-nesting species and also should tell us whether substantial second-nesting has taken place among mallards and pintails that had lost first nests. An examination of Table IV shows that little re-nesting took place among pintails (mainly because of initial success) although there was a stronger second effort by mallards. That the large proportion of potential broods was of later nesting species is evidence of encouraging progress of this hatch.

Moulting Hens

Usually the presence of large numbers of moulting hens in banding drives during the first half of July indicates that many first nests have been destroyed too late in the incubation period to permit re-nesting. This was not the case in 1952:

	Kerrobert, Saskatchewan				Laura, Saskatchewan		
July	10	12	14	19	July	26	28
Percent of Pintails Hens	3	8	12	29		44	38
Total Adult Pintails	900	1,980	391	821		245	432

This increase in pintail hens more than likely signified desertion of mature young by the hen, rather than loss of nests, since it coincided with general flocking of flying young.

CHART 1. - 1952 WATERFOWL CROP OUTLOOK - Southern Saskatchewan (as of June 1, 1952)

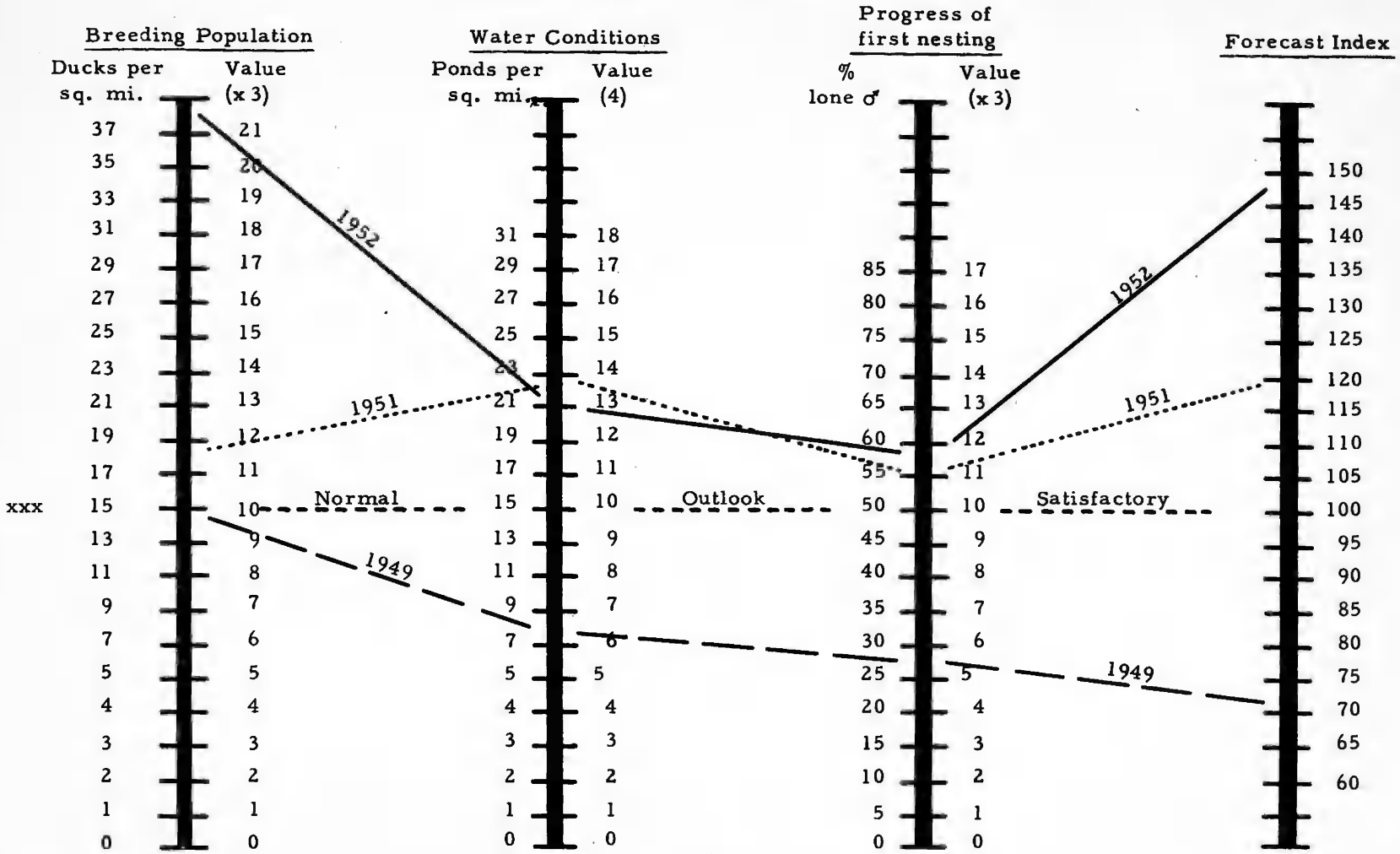
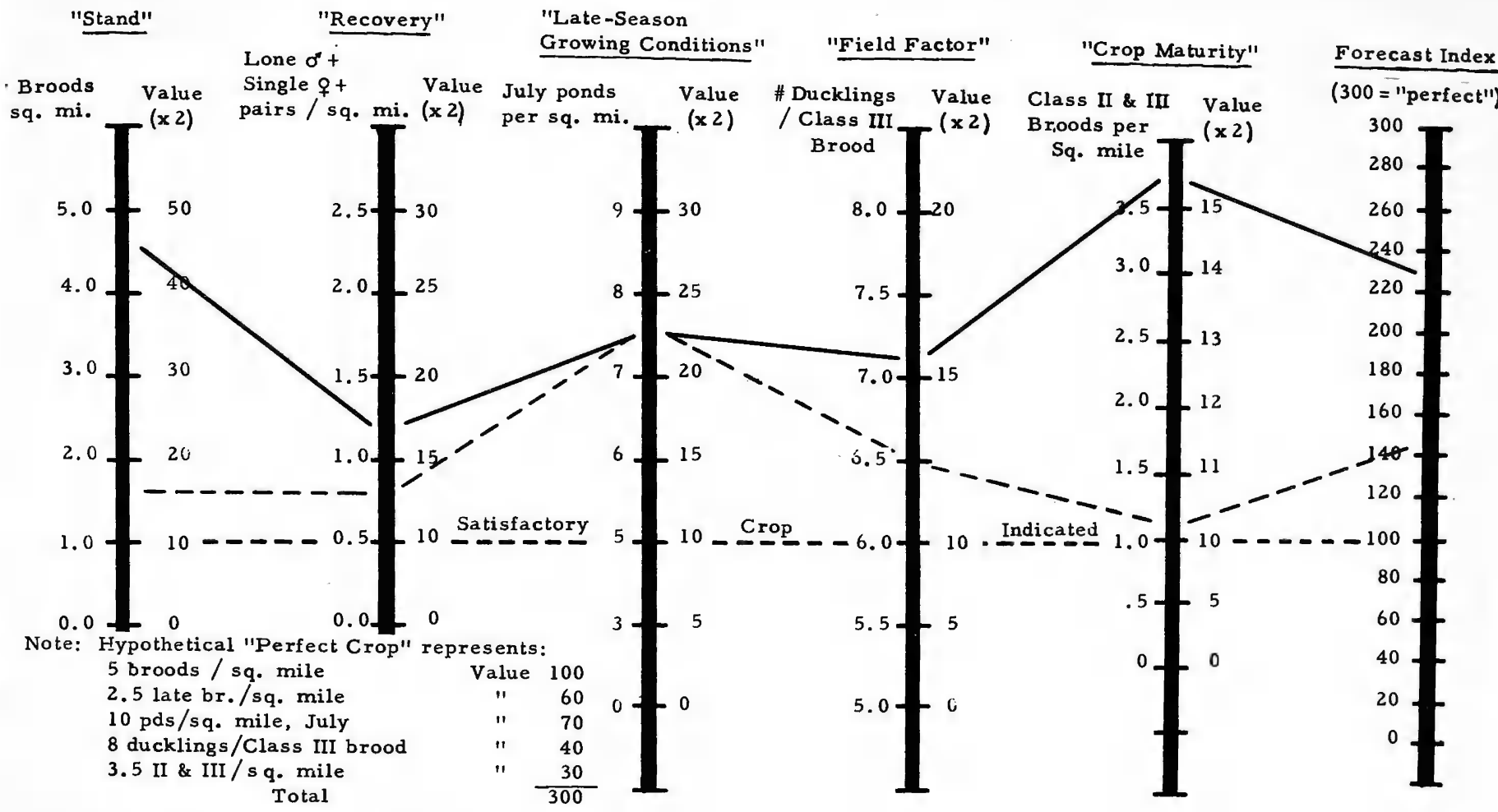


CHART 2. - Waterfowl Crop Forecast for Southern Saskatchewan as of August 1, 1952



Note: Hypothetical "Perfect Crop" represents:

5 broods / sq. mile	Value	100
2.5 late br./sq. mile	"	60
10 pds/sq. mile, July	"	70
8 ducklings/Class III brood	"	40
3.5 II & III/sq. mile	"	30
Total		300

Adult-Juvenile equiv: 1:3

Crop Forecasting

To be of use to wildlife administrators, waterfowl survey data must be available to the Canadian Wildlife Service by June 15 and to the U. S. Fish and Wildlife Service by August 1 of each year. However, waterfowl production in Saskatchewan usually continues beyond these deadlines, and the season's waterfowl crop may not have fully materialized until September. It is therefore necessary to predict, or forecast what may happen to the present crop, having a knowledge of present conditions. It was with the desire to integrate the pertinent measurable factors and set them in proper perspective that the forecast charts were first devised. For the June forecast, the number of ducks per square mile is shown to the left of the first column, a corresponding value is given for it on the right and the value is weighted (x 3); the same is done for ponds per square mile and percent drakes. The weighted values are then added together to give a "forecast index". This is done for the years 1949, 1951 and 1952 in Chart 1. A similar procedure, using five factors is followed for broods in Chart 2, and constitutes a forecast as of August 1.

Speciation of Broods

This was carried on as an experiment and the results are presented in Table IV. No conclusions were reached, other than the fact that it was found possible to identify more than a third of the broods seen (1,223 out of 3,051).

Summary

The most abundant surface water supply in recent years, coupled with the largest over-wintering crop in history, greeted the spring flight of waterfowl into Saskatchewan. A population double that of 1951 took advantage of this situation. Ideal April weather allowed pintails to get started on what proved to be a phenomenal hatch from the first attempt. Mallard production was also excellent from this early nesting but losses here were heavier than for pintails. Aerial survey data revealed more than three times the number of broods produced in 1951 and a potential production figure following the survey period was almost twice that of last year. Brood size and distribution showed improvement, and water conditions in July were ample for all broods.

The return of water to the western grasslands (constituting almost one-third of the surveyed area) may have enticed numbers of northern bound pintails to remain and nest. In parts of this habitat there are now two and three pintails for every mallard. This was the situation throughout the entire surveyed area in 1947 and 1948; but in 1949, both the water and the pintail disappeared and the ratio was reversed; it is now about one to one. With the maintenance of present conditions we may expect a complete return of the apparently not-too-adaptable pintail to its former dominant position in Saskatchewan.

Banding

This year's banding was carried out, for the most part, in the grassland area of western Saskatchewan where fruitful banding had not previously been possible. The principle banding districts were Kerrobert, Kindersley, Laura and Mortlach; water levels in Johnstone and Eyebrow Lakes were too high. A survey

through the east-central part of the Province (Humboldt, Lake Lenore) uncovered no suitable banding sites with sufficient concentrations of waterfowl.

Throughout the banding period (July 2 - August 5) strong winds and frequent showers interfered with operations to the extent of preventing several drives and delaying others. In spite of these difficulties the six-man crew banded more than 11,000 birds. This effort included a single drive of 3,080 waterfowl. More flightless young were banded this year than in any previous one.

Table I - Computation of May, 1952 Waterfowl Population - Southern Saskatchewan

	Stratum A Grass Prairie	Stratum B Prairie Forest	Stratum C Shortgrass prairie	Provincial Totals
Stratum Area (sq. miles)	52,230	50,520	11,290	114,040
Sample Size (sq. miles)	865.5	272.5	127.0	1,265.0
Total Ducks Seen	22,971	6,152	2,750	-
Percent Lone Drakes	57.1	60.3	56.0	57.6
Adjusted Total (One female for each lone male)	36,087	9,862	4,290	-
Ducks per square mile (adjusted)	41.7	36.19	33.78	38.5
Population Index Figure	2,177,991	1,828,318	381,376	4,387,685
Ponds Per square mile	19.7	22.9	11.2	20.3

Table II - Computation of July, 1952 Broods - Southern Saskatchewan

	Stratum A	Stratum B	Stratum C	Provincial Total
Stratum Area (sq. miles)	52,230	423.0	11,290	114,040
Sample Size (sq. miles)	423.0	173.0	63.0	659.0
Total Broods Seen	2,109	625	317	-
Broods per square mile	4.98	3.60	5.03	4.37
Brood Index	260,105	181,872	56,788	498,765
Potential Late Broods	587	157	131	-
Potential Late Broods per square mile	1.4	0.9	2.0	1.2
Late Brood Index	73,122	45,468	22,580	141,179
Number Ponds	73,122	2,033	978	-
Ponds per square mile	9.0	5.9	7.7	7.5
Pond Index	470,070	298,068	86,933	855,071

Saskatchewan Comparisons:

	1950	1951	1952
Broods per square mile	0.9	1.34	4.37
Potential late broods per sq. mile		0.7	1.2
Ponds per square mile	5.7	7.6	7.5
Average size - Class III broods		6.5	7.1
Number of Class II and III broods per square mile		1.2	3.8

Table III - Species Composition of Breeding Population - Aerial Surveys Saskatchewan

Species	1951 Pairs Per * Square Mile	1951 Percent	1952 Pairs Per * Square Mile	1952 Percent
Mallard	3.5	37.4	6.5	34.6
Pintail	3.1	33.2	6.0	31.4
Shoveler	0.6	6.4	1.4	7.6
Blue-winged teal	0.6	6.4	1.2	6.1
Baldpate	0.6	5.9	1.2	5.5
Gadwall	0.2	1.6	0.5	2.4
Scaup	0.4	3.7	1.0	5.0
Canvasback	0.3	2.7	0.7	3.7
Redhead	0.1	1.1	0.2	0.8
Green-winged teal	0.05	0.5	0.1	0.5
Scoter	)		0.2	1.1
Ruddy duck	)		0.15	0.8
Goldeneye	) 0.1	1.1	0.04	0.3
Ring-necked duck	)		0.03	0.1
Bufflehead	)		0.03	0.1
Total	9.55	100.0	19.25	100.0

* Adjusted for lone drakes.

Table IV - Species Composition of Broods Observed During Aerial Surveys

Species	Number Identified	Percent Distribution	No. Potential Late Broods *	Percent Distribution
Pintail	626	51.2	80	11.2
Mallard	389	31.8	176	24.6
Baldpate	29	2.4	93	13.0
Shoveler	85	6.9	63	8.8
Gadwall	24	1.9	81	11.3
Blue-winged teal	34	2.8	110	15.4
Scaup	5	.4	42	5.9
Ruddy duck	6	.5	25	3.5
Canvasback	19	1.6	4	.6
Other	6	.5	41	5.7
Total	1,223	100.0	715	100.0

* Determined by the number of pairs, single females and lone drakes seen during July transects.

Table V - Summary of Birds Banded on Study Areas

Species	Adults		Flightless Young		Total
	Male	Female	Male	Female	
Pintail	4,097	694	205	146	5,142
Green-winged teal	2,606	104	8	7	2,725
Blue-winged teal	958	154	122	92	1,326
Mallard	413	82	142	143	780
Shoveler	93	48	145	114	400
Baldpate	39	14	112	87	252
Scaup	-	-	29	36	65
Gadwall	5	1	21	11	38
Canvasback	-	-	9	5	14
Redhead	1	1	2	1	5
Black duck	2	-	-	-	2
Total	8,214	1,098	795	642	10,749
Canada geese		-		5	5
Coot		415		104	519
Others		-		5	5

WATERFOWL BREEDING GROUND SURVEY IN SASKATCHEWAN

KINDERSLEY-ESTON STUDY AREA

J. B. Gollop

Methods of Sampling and Area Covered

The Kindersley-Eston Study Area is located in the (light) brown soil zone which occupies that part of the grassland region of southwestern Saskatchewan from Lloydminster on the northwest to Weyburn on the southeast. It consists of an 82-mile transect (one-quarter mile wide) along the following route: #7 Highway from the Brock Road west to Kindersley, #30 south to Glidden, #44 east to Eston, and a secondary (dirt) road north to its junction with #7 (cf. map in aerial report).

The area was chosen for two reasons: first, prior to 1951 there had usually been a high breeding population but very low production. An investigation of this situation was desirable because it applied to approximately one-third of the southern half of Saskatchewan. Secondly, a knowledge of the relation of the aerial count, on which Provincial waterfowl trends are now wholly based, to the actual ground population was needed. It was known that the visibility of waterfowl from the air varies over different habitats and with different species. The Kindersley and Caron areas were to be used to determine what correction factors might be necessary for the treeless, open sloughs of the mixed prairie section of the Province. As for the first phase, this year the production was in line with the breeding population, and the data obtained are presented in this report. As for the second aim, some data have been gathered and they are also presented.

Observations were made within one-eighth of a mile on each side of the road along the 82-mile transect, giving a 20.5 square mile sample. Where the transect line dissected a slough, record was kept of the birds beyond it, where practical, in such a way that they could be later separated from birds in the transect. Several areas, however, extended for more than a mile from the road; one, crossing the transect south of Kindersley and again east of Glidden, was estimated to be thirty-five miles long.

Four coverages were made between May 13 and June 5 for breeding pairs. On each of these coverages, areas on one side of the road were circled, where practicable, and areas on the other were observed from a vantage point for periods varying from five minutes to more than an hour. Two complete coverages were made for broods, one in July and one in August, with a partial one the last week in June, not completed because of impassable roads. On these three coverages all areas were worked over carefully and, where possible, flightless young were caught (with fish-landing nets) and banded. The writer had assistance for the July coverage from Bob Caldwell, Ducks Unlimited, and in August from Don Reid, Canadian Wildlife Service; in May and June he worked alone.

To gather additional data thirty-one water gauges were erected and a total of thirty-six photographic stations were set up on twenty-nine sloughs; pictures were taken on each coverage.

Description: Although located in the most arid of the Province's soil zone, the study area consists primarily of a highly drought-resistant association of soils known as Sceptre, and this mixed with Regina and Haverhill associations. Sceptre consists of "heavy textured soils developed on uniform clay deposits occupying the beds of former glacial lakes". The topography is primarily "undulating to gently rolling" with small scattered patches of "flat to depressional" alluvium and alkali. The altitude varies from about 2,150 to 2,350 feet above sea level.

The dominant native upland grasses are grama (Bouteloua), spear-(Stipa), wheat-(Agropyron) and June grass (Koeleria). The area is, however, intensely farmed and little ungrazed land, or even pasture, is to be found except on the Eston-Brock stretch. On May 15, about 44 percent of the transect area was stubble or swath and about 33 percent summer fallow; 7 percent was road ditch, 7 percent pasture and prairie, 5 percent water and 4 percent buildings and miscellaneous. Wheat, barley and oats are the principal crops grown. The growing season at Kindersley is reportedly about 110 days and at Eston 120+.

Many of this year's sloughs were devoid of vegetation -- being newly-flooded areas on summer fallow, stubble or crop. Where emergent vegetation was to be found, it was usually sedge (Carex), smartweed (polygonum) or spikerush (Eleocharis) Pondweed (Potamogeton) appeared to be the dominant submergent vegetation.

Spring: Heavy winter snows blanketed the largest over-wintering crop in history. A flight over the area on April 1 showed that there was a few sloughs open south of Glidden, but snow still covered the land. Snipe Lake was open only along the edges as were other large water areas in the district. No waterfowl were seen. A similar flight on April 18 showed the larger sloughs to be still partly frozen but snow was confined mostly to ditches. Pintail, mallard, baldpate, shoveler, redhead, scaup, canvasback and bufflehead were identified as well as 525+ Canada geese, 700+ snow and blue geese, and 3,000+ cranes.

According to the R.C.M. P., pintails and mallards arrived in numbers between April 3 and 5. The rest of April was unseasonably warm and dry so that work on the land was in full swing early in May. Between May 15 and June 5, more than 90 percent of the stubble -- prime nesting cover for pintails and mallards -- was either seeded or put to summer fallow on the study area.

Water Conditions

In the memory of all farmers interviewed, 1952 saw the highest water in the western grasslands; 1919 is apparently the only year that rivaled it. Indicative of the situation is an area east of Glidden: dry in the autumn of 1950, it reportedly held seventeen feet of water this spring. More detailed data on water areas are presented in Table III. From this table it will be seen that the number of water areas dropped from 10.7 per square mile in mid-May to 2.3 the first week of August. This latter figure, however, consisted mainly of larger areas (10+ acres in May) and, while a few had shrunk significantly by August, many of them closely approximated their spring areas and were still above the rims of vegetation which apparently marked the 1951 spring levels. In general, the weekly drop was less on larger areas; this may be partly due to their larger drainage systems, wherein there may be greater runoff of the summer's precipitation.

There was apparently sufficient water throughout the season for even the latest broods.

Breeding Population Trends

Work on the area was started much too late to obtain a clear picture of the progress of the breeding cycle. The data from the coverages made for breeding pairs are presented in Table I; species composition are to be found in Table II. The average density of these four coverages is 58.8 pairs per square mile with pintails and mallards accounting for 40 of these. Soper (Special Scientific Report No. 60) in 1948 reported 11.7 pairs (including lone drakes) per square mile on his May 11 - June 10 coverage of transect 33 (Kerrobert to Kindersley to Rosetown); his ducks-per-square-mile figure is 24.5. Whether or not these figures are directly comparable with 1952 is not known.

On the first coverage over 80 percent of the pintails and mallards seen were drakes, indicating that the season was well advanced; this was verified by the appearance of three broods before this first round was completed. It is known that figures for the first coverage are high because some birds beyond the transect line were not marked so that they could later be segregated. The variations in the numbers of mallard and pintail pairs probably were due primarily to the movements of flocks of drakes (each individual taken to represent a pair) in and out of the transect. While the samples are small, there are indications of an influx of shovelers, green-winged teal and gadwall into the area the last week of May, and of blue-winged teal the first week in June. With the small number of divers, their location on the larger water areas could easily account for the population fluctuations.

Nesting: An attempt was made to locate nests by car and on foot and follow them to completion, but only 85 were found and the outcome of many of these could not be definitely determined because of the difficulty of marking them permanently on land undergoing cultivation. Pintails and mallards apparently made most use of the swath and stubble, but gadwall, green-winged and blue-winged teal and shovelers were also found nesting there. The heaviest nesting density found was on June 5 in a 160-acre stubble field containing a six or seven acre slough. By driving a car ten miles through the field, effective coverage was given to about three acres; the density for this sample was four nests per acre; twenty-two nests of the above named species were actually found although the field was not thoroughly covered. It was being seeded that day and, in all probability every nest was partially or wholly destroyed.

Predators were apparently few. Richardson's ground squirrel, while fewer than in the past few years, was the only rodent seen in numbers sufficient to cause damage. One coyote was seen, one family of skunks and no badgers, although they were present. Magpies were very scarce and crows were sparsely distributed; the only trees are in windbreaks around farms.

Losses attributable to agriculture were seen to take on several forms:

(a) Two cases of pintails incubating 100-150 yards from the road, but in plain view from it, all nesting cover having disappeared in harvest operations.

(b) Several instances of birds incubating 3-5 eggs (sometimes 1 or 2 cracked) with several broken eggs nearby.

(c) Entire sets destroyed by seeding or disking.

(d) Two mallards nests destroyed with young sitting on them; some, if not all, were killed.

(e) Two hens injured on nests so that they had to be killed (1 pintail, 1 shoveler).

Success of the Season

The data for the July and August brood coverages are presented in Table II; the coverage of June 3-5 was primarily for pairs. Combining the broods seen in July with the Class I and II broods noted in August, a density of 23.5 per square mile is obtained. Combining the July broods, broody hens and potential later broods (indicated by pairs and lone drakes), this figure is 23.2. Pintails and mallards make up 15.1 of the broods per square mile (adjusted for unidentified) or 64.3 percent.

In 1948, Soper ran Transect No. 33 (cf. above) and No. 34 (Rosetown - Elrose - Glidden) sometime between June 16 and July 11. His data indicate 1.1 broods per square mile for the former and 2.1 for the latter; he also records 6.9 and 4.8 pairs per square mile, respectively, for totals of 8.0 and 6.9 broods per square mile. It is believed that these data are comparable and indicate about one-third of the 1952 production.

With the appearance of the first broods, a difference between pintail and mallard nestings was indicated. Three pintail broods were noted on May 17, five days ahead of the first mallard brood. The June 3-5 coverage showed 25 percent of 121 pintail broods to be a week, or less, old while 65 percent of the 34 mallard broods were in this category. Both species reportedly arrived back at the same time and their incubation periods are similar. Apparently pintails settled down to nesting a few days earlier than mallards. Normally this might not mean much but this year, with such widespread spring harvesting, it apparently made the difference between little and moderately heavy re-nesting. The July coverage showed 39 percent of 101 mallard broods to be in the downy stage, while only 9 percent of 202 pintail broods were in this class. On the same coverage, 80 percent of the pintail broods were Class III compared to 32 percent of the mallards. While differences in the length of the pre-flight period might account for some of the Class III percentages, the more even distribution of mallard broods in all age classes probably reflects re-nesting attempts due to agricutlural losses. This, however, does not mean that pintails were more successful on the whole than mallards. A comparison of broods to pairs (Table II) shows that pintails were 36 percent successful while mallards were 41 percent. This means that 2.8 pairs of pintails produced one brood while only 2.5 pairs of mallards did the same. This is a further indication of the pintail's earlier nesting; it suggests that agricultural losses suffered by this species were actually much heavier than those suffered by the mallard, but many of the pintail hens did not renest because the losses came at a much later stage in incubation.

Because of the nature of the study area, there is some doubt that the brood-to-pair comparison is valid. In May only one area in five was partly beyond the transect line; in August this ratio was one to one. In general, this meant that the majority of pairs registered in the transect took their broods to areas partly in and partly out of it.

The broods from pairs that originally held territories on these larger areas also moved freely about them, back and forth across the transect line. Adequate records could not be kept of the pairs out of the transect with the result that brood-to-pair comparisons had to be made for birds noted within the eighth-mile strip at the time of the coverage.

Broods averaged 7.1 ducklings each. Class I, June broods for pintail and mallard averaged 7.4 (93 broods) and 7.9 (23 broods) respectively; with samples of only 10 and 25 broods, the July averages for Class I were 5.7 and 6.2 respectively; indicative of second attempts.

Ground-to-Air Comparisons: Three coverages were made of the transect by John Lynch, U. S. Fish and Wildlife Service, assisted by Bill Hyska of the Provincial Game Branch and Floyd Thompson of the U. S. Fish and Wildlife Service. The results of these coverages are presented in Tables I and IV.

For the over-all breeding pair density, the air crew recorded 57 percent of the ground figure. In species composition there was a definite bias in favour of pintails and against both species of teal. This is partly reflected in the "percent drake" section where that for pintails by air is much higher than the ground figure, as is the over-all figure - 87.5 percent compared to 73.5 percent.

With regard to brood density the two coverages yielded 40 and 42 percent of the ground figure. The very small samples probably do not justify the comparison of species composition or age classification. Eighty percent of the actual and potential broods were identified in the June 27 coverage; this figure was 38 percent for the July round. Of the first count broods actually seen made up 83 percent; they composed only 52 percent of the second survey.

Relation to Remainder of Soil Zone: The transect as it now stands could not be considered typical of much of the Brown soil zone. The soils are above average in moisture efficiency and the transect contains little rolling and no hilly topography -- with characteristically smaller, deeper sloughs in higher densities. The difficulty of working it on a transect basis with such large water areas has already been mentioned. It is felt some revision will be necessary for 1953.

Summary of Banding Operations

The banding of flightless young on the study area was carried out by Floyd Thompson and his crew and by the writer with help from Bob Caldwell, Don Reid and members of the banding crew. Floyd Thompson carried out three drives which yielded 320 young and the writer, working all possible sloughs on the transect, caught 379, using fish-landing nets. A tabulation of the catch is presented in Table IV.

An additional 8,081 birds were banded in the Kerrobert district, 30 miles north of Kindersley.

Summary

Water levels were the highest in recent years on the 20.5 square-mile Kindersley-Eston Study Area, set up on regular transect form.

Four coverages were made for breeding pairs; the average density was 58.8 pairs per square mile with the pintail and mallard making up 28 and 12 pairs respectively.

Two coverages were made for broods and resulted in a density of 23.5 broods per square mile (pintail 9.9 and mallard 4.9).

Three aerial coverages of the area indicated that the air crew saw 57 percent of the breeding pairs recorded from the ground and 41 percent of the broods in this section of the treeless grasslands.

Number of flightless young banded on sloughs along the transect totalled 699.

Table I - Waterfowl Breeding Ground Survey in Saskatchewan - Kindersley-Eston Study Area (20.5 Square Miles)

	Pin-tail	Mal-lard	Shov-eler	B-w. teal	Bald-pate	G-w. teal	Gad-wall	Scaup	Red-head	Canvas-back	Ruddy	Unid.	TOTAL
BREEDING POPULATION													
Total Adults Seen (including Females with Broods)													
Ground May 13-17	826	322	162	127	119	48	44	35	10	3	4	8	1,708
Ground May 20-22	664	241	146	123	91	35	24	24	2	2	1	14	1,367
Ground May 28-30	723	373	165	120	98	71	45	46	20	11	2	2	1,676
Ground June 3- 5	806	360	169	174	103	71	44	37	12	22	-	5	1,803
Air May 18	363	109	33	16	43	4	13	4	-	4	-	196	785
Pairs Represented (i.e. Total Drakes)													
Ground May 13-17	668	263	110	78	68	36	24	26	6	3	3	5	1,290
Ground May 20-22	527	194	103	80	59	29	14	16	1	2	1	11	1,037
Ground May 28-30	512	274	129	94	69	51	30	30	13	9	2	1	1,214
Ground June 3- 5	577	247	127	120	78	47	31	25	8	15	-	4	1,279
Average Ground	571	245	117	93	69	41	25	24	7	7	1.5	5	1,205
Air May 18	345	92	30	10	25	2	8	2	-	2	-	172	688
PERCENT DRAKES													
Ground May 13-17	81	82	68	61	57	75	55	76	(Insufficient Sample)				75.6
Ground May 20-22	79	81	71	65	65	83	58	67					75.1
Ground May 28-30	71	73	79	78	70	72	67	65					72.4
Ground June 3- 5	72	69	75	69	76	66	70	68					71.0
Air May 18	95	84	91	63	58	50	62	50					87.5

Table II - Waterfowl Breeding Ground Survey in Saskatchewan - Kindersley-Eston Area (20.5 Square Miles)

	BROODS												
	June 3 - 5				July 2 - 8			August 7 - 10			July 2 - 8		
Species	I	II	F's	Total	I	II	III	I	II	Total	F's	Prs. & Drakes	Substitute Total
Pintail	110	11	11	132	18	21	157	1	6	203	6	0	202
Mallard	34	0	3	37	34	26	28	8	4	100	6	7	101
Shoveler	2	0	0	2	24	24	3	0	5	56	2	5	58
B-w. teal	0	0	0	0	17	9	0	4	9	39	2	13	41
Baldpate	0	0	0	0	19	4	0	2	4	29	1	7	31
G-w. teal	1	0	0	1	10	8	1	2	2	23	1	4	24
Gadwall	0	0	0	0	2	0	0	1	2	5	0	1	3
Scaup	0	0	0	0	4	0	0	1	2	7	0	0	4
Canvasback	1	0	0	1	4	2	0	0	1	7	0	1	7
Redhead	0	0	0	0	1	0	0	0	1*	2	0	0	1
Unidentified	2	0	0	2	3	1	0	4	2	10	0	0	4
Totals	150	11	14	175	136	95	189	23	38	481	18	38	476

* Three redheads in brood with 16 scaup.

Substitute total includes Class I, II and III broods for the July 2 to 8 coverage as well as Hens, Pairs and Lone Drakes.

(continued)

(continued)

Table II - Waterfowl Breeding Ground Survey in Saskatchewan - Kindersley-Eston Area (20.5 Square Miles)

SPECIES COMPOSITION

Pairs : Broods

Species	Total Number		Density per Sq. Mile		Percentage	
	Av. No. Prs. Represented	Broods	Av. No. Prs. Represented	Broods	Av. No. Prs. Represented	Broods
Pintail	571	203	27.9	9.9	47.4	42.5
Mallard	245	100	12.0	4.9	20.4	21.0
Shoveler	117	56	5.7	2.7	9.7	11.6
Blue-winged teal	93	39	4.5	1.9	7.7	8.2
Baldpate	69	29	3.4	1.4	5.8	6.0
Green-winged teal	41	23	2.0	1.1	3.4	4.7
Gadwall	25	5	1.2	0.2	2.0	0.9
Scaup	24	7	1.2	0.3	2.0	1.3
Canvasback	7	7	0.3	0.3	0.5	1.3
Redhead	7	2	0.3	0.1	0.5	0.4
Ruddy duck	1.5	-	0.1	-	0.2	-
Unidentified	5	10	0.2	0.5	0.3	2.1
Totals	1,205	481	58.8	23.5		

Percent Successful:

Pintail 35.6
Mallard 40.8
Others 44.0

All Species: 39.9 percent

Table III - Waterfowl Breeding Ground Survey in Saskatchewan - Kindersley-Eston Area (20.5 Square Miles)

WATER AREA AND WATER GAUGE DATA

A. - Water Areas by Size

Size	0.1 - 1.0 Acres	1.1 - 10.0 Acres	10.1 - 160 Acres	640 + Acres	Total
Total Areas	144	49	24	2	219
Percent	66	22	11	1	100
Density per Square Mile	7.0	2.4	1.2	0.1	10.7

B. - Water Area Survival

	May 13-15	Surviving June 3-7	Surviving July 3-8	Surviving August 7-10
Total Areas	220	123	77	48
Percent	-	56	35	22
Density per Square Mile	10.7	6.0	3.8	2.3

C. - Average Weekly Drop (inches) By Size

Size	May 13-17 to June 3-5	June 3-5 to July 2-8	May 13-17 to Aug. 7-10
0.1 - 1.0 acres	2.61 (7 areas)	2.21 (3 areas)	1.79 (2 areas)
1.1 - 10.0 acres	1.62 (11 areas)	1.02 (7 areas)	1.16 (4 areas)
10.1 - 160 acres	1.38 (7 areas)	0.97 (6 areas)	1.14 (5 areas)
640 + acres	1.42 (3 gauges)	0.63 (3 gauges)	0.98 (2 gauges)

D. - Precipitation (inches)

Station	Distance Direction	Nov. 1/51 - March 31/52	April 1 - May 15	May 15 - June 4	June 4 - July 5	May 15 - August 8
Kindersley		1.7	1.81	1.03	1.57	4.86
Rosetown	50 Miles E.	3.6	1.27	1.01	3.28	6.47
Empress	51 miles SW.	-	1.09	1.06	2.81	6.66

Table IV - Waterfowl Breeding Ground Survey in Saskatchewan - Kindersley-Eston Area (20.5 Square Miles)

A. - Ground-to-Air Comparison

Species	Breeding Pairs Represented (Per Square Mile) Average Ground	AIR May 18	(Percentage) Average Ground	AIR May 18	Broods (Per Square Mile) Ground July 2-8	AIR June 27	AIR July 9
Pintail	28.0	22.4	47.6	66.8	9.9	3.3	4.4
Mallard	12.0	6.0	20.4	17.9	5.0	1.8	2.8
Shoveler	5.8	2.0	9.8	6.0	2.9	1.5	0.8
B-w. teal	4.6	0.6	7.8	1.8	2.0	0.4	0.3
Baldpate	3.4	1.6	5.8	4.8	1.5	1.2	0.3
G-w. teal	2.0	0.1	3.4	0.4	1.2	-	-
Gadwall	1.2	0.5	2.1	1.5	0.1	1.0	0.3
Scaup	1.2	0.15	2.0	0.4	0.2	0.1	0.8
Redhead	0.3	-	0.6	-	0.3	-	-
Canvasback	0,3	0.15	0.6	0.4	0.05	-	0.3
Ruddy	0.1	-	0.1	-	-	-	-
Total	58.8	33.6			23.2	9.3	9.8

Adjusted for unidentified.

	Brood Age Classification Total	Class I	Class II	Class III	Brood Size Average	Total
Ground July 2-8	420	32	23	45	7.1	309*
Air June 27	36	25	39	36	7.1	36
Air July 9	42	26	26	48	7.5	17

* June, July and August Broods.

B. - Banding

	Mallard	Gadwall	Baldpate	G-w. teal	B-w. teal	Shoveler	Pintail	Redhead	Canvasback	Sc.	Total
Thompson et al:											
Flightless Males	39	-	1	-	4	18	121	-	-	-	183
Flightless Females	31	-	2	2	1	24	77	-	-	-	137
Gollop et al:											
Flightless Males	49	2	16	14	42	31	36	2	1	3	196
Flightless Females	39	2	10	13	27	39	44	-	1	8	183
Total	158	4	29	29	74	112	278	2	2	11	699

ADULTS: 5

NECK-BANDING: Mallards 81; Pintails 209; TOTAL - 290.

WATERFOWL BREEDING GROUND SURVEY OF REDVERS AREA, SASKATCHEWAN

Jerome H. Stoudt

The Redvers study area was established for the purpose of determining: (1) waterfowl production per breeding pair in the aspen parkland habitat type; (2) the effect of changes in water levels, predation, presence or absence of aquatic vegetation, agricultural operations and other factors upon that production; and (3) the actual number of breeding pairs and broods per square mile on the area in order to compare with aerial surveys over the same area.

Description of the Area

The Redvers study area is located in the extreme southeastern end of the aspen parklands area (see Map 1). This parkland prairie is an aspen grove area and consists of black soil of grassland formation. Most of the aspen groves, locally known as "bluffs", consist of pure stands of quaking aspen, Populus tremuloides, although in the wetter locations the balsam poplar, Populus balsamifera, occurs quite commonly. Snowberry, Symphoricarpos, and several species of willows, Salix spp. are the most abundant shrubs, with the latter occurring in and around the shoreline of the numerous ponds in the area.

The study area is in a zone of mixed farming including small grain, livestock production and dairying. Small grains that are grown include wheat, oats and barley. Fields vary in size from a few acres up to a square mile. The soils are shallow black types, although the cultivated fields have a dark gray to light grayish color, due to the calcareous nature of the soil.

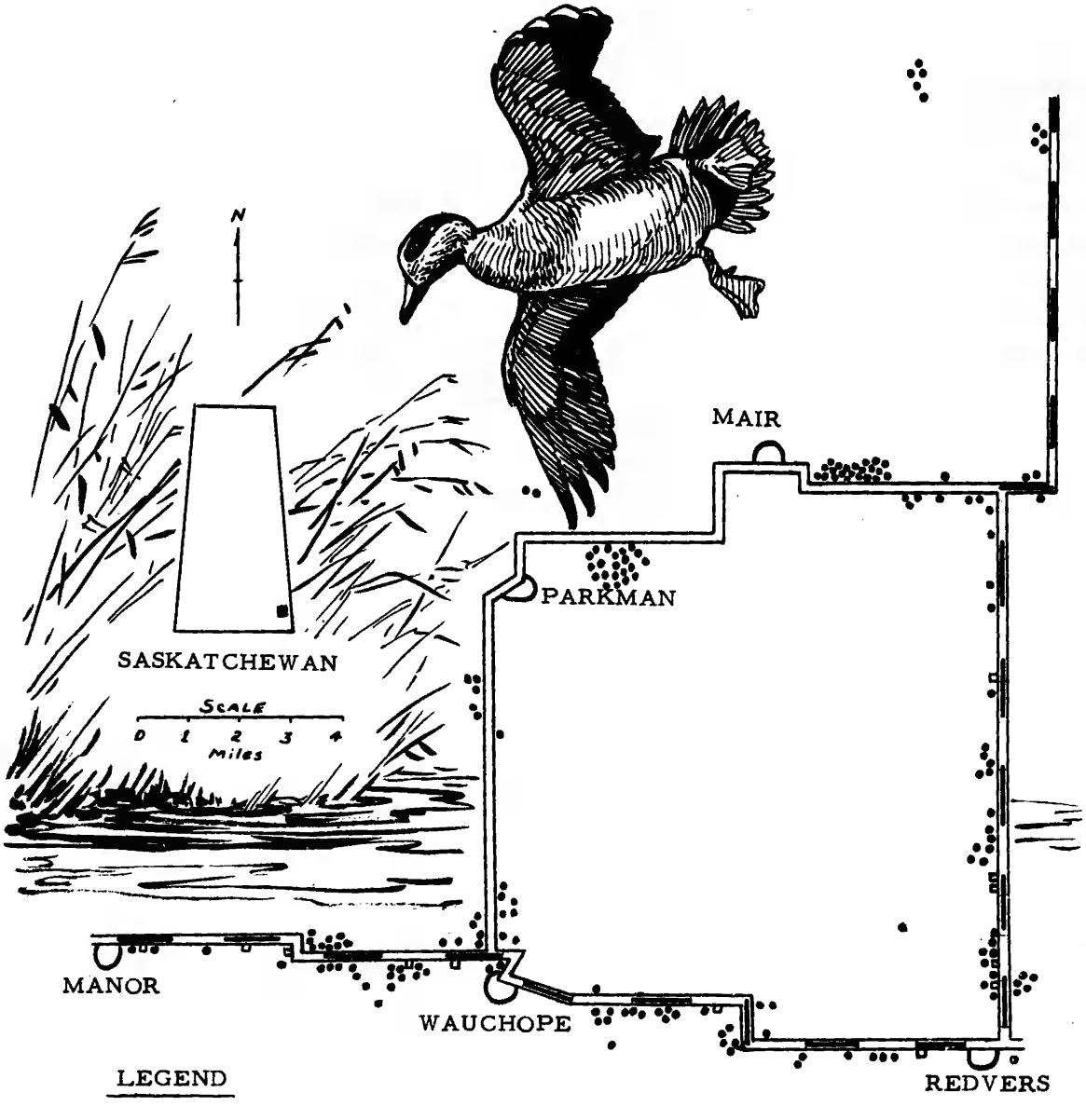
Three species of ground squirrels are the most abundant animals on the area with the destructive Franklin's ground squirrel very common. Skunks, mink, and muskrat were common with a few badger, coyote and fox also in the area. Other than ducks, crows were by far the most abundant bird, while magpies were fairly common.

The study area was laid out along a gravel road 20 miles west of Manor and 20 miles north of Redvers, Saskatchewan. A strip 1/8th mile wide on one side of the road was chosen in order to eliminate any "roll-up" of pairs by enabling the census taker to "watch-down" all breeding pairs which had been flushed. All water areas were paced-out and mapped, using a scale of 1 inch to equal one square chain (.1 acre). Map 1 shows the location of the transect.

Weather and Water Conditions

After an unseasonably warm April, the month of May continued to be quite warm and dry. Dry moderate weather continued until June 20, when the first appreciable rain fell. After that date frequent rains helped to retard water area shrinkage. No frosts or prolonged wet and cold periods occurred during the nesting season. Everything considered, conditions during the nesting season were thought to be excellent.

REDVERS STUDY AREA TRANSECT AND ADJOINING AREA



LEGEND

Study Area Transect

Locations of Nests Observed

Locations of Water Gauges

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Precipitation during the breeding season can be compared to normal as follows:

	April	May	June	July	Total
Normal precipitation	0.91	1.38	3.12	1.96	7.37
Precipitation in 1952	0.40	0.04	4.57	2.17	7.18

It is evident that the precipitation for the entire period was not much below normal, although the first two months were very dry. Water gauges set in May showed about a two inch drop every ten days until the rains came on June 20. The following table illustrates the shrinkage in number of ponds on the study area.

Table 1 - Change in Number of Water Areas during the 1952 Breeding Season

	May 10-20	June 2-6	July 1-6	July 25-29
Total number of areas	306	306	306	306
Number of areas containing water	306	244	253	181
Percent of areas which contained water	100	80	83	59
Total number of open areas * with water	154	139	142	116
Percent of open areas still containing water	100	90	92	75
Total number of wooded * areas with water	152	105	111	65
Percent of wooded areas still containing water	100	69	73	43

*Wooded water areas are those areas which had two-thirds or more of the shoreline bordered by willows or aspen. Most of the areas had close to 100 percent of the shoreline in willow or aspen. The open areas had no brush or only scattered amounts in clumps along a small part of the shoreline.

An average of twelve water gauges set on May 27 showed the following fluctuations thereafter:

Table II - Fluctuation of Water Levels Based on 12 Water Gauges

Date	May 27	June 3	June 16	June 26	July 6	July 16	July 27
Change (inches)	0	-1.31	-3.35	-4.77	-1.75	-4.04	-4.50

In general, water conditions were very satisfactory for both nesting and brooding although levels were a foot or so lower than in 1951. As a result of the low water levels, much good diving duck nesting habitat was high and dry in 1952. Higher levels might have resulted in a larger diving duck and coot population.

The Breeding Population

Two censuses of breeding pairs were taken. The first was made between May 10 and 20, and the second between June 2 and 6. Results are found in Table III.

In addition to the pairs and lone drakes recorded on the second run, 58 hens with broods were counted, including 43 mallard, 8 pintail and 7 canvasback. If these

are added to the "Total Pairs" in the following Table, it brings the June count to within 49 of the May count. During the May coverage it was evident that most of the ducks were settled down on breeding territory and for the purposes of this report the breeding pair count from the May 10-20 coverage will be used as the breeding population.

Table III - Breeding Pair Census - Redvers Study Area

Species	Males		Pairs		Total Pairs (Males plus Pairs)		Difference
	1st Run	2nd Run	1st Run	2nd Run	1st Run	2nd Run	
Mallard	195	106	70	78	265	184	- 81
B-w. teal	36	95	106	67	142	162	+ 20
Pintail	49	23	15	8	64	31	- 33
Baldpate	4	17	28	18	32	35	+ 3
G-w. teal	14	27	18	16	32	43	+ 11
Canvasback	9	1	14	9	23	10	- 13
Lesser scaup	3	3	12	9	15	12	- 3
Shoveler	1	7	11	4	12	11	- 1
Gadwall	-	3	7	10	7	13	+ 6
Ring-necked duck	-	3	4	2	4	5	+ 1
Redhead	1	-	3	2	4	2	- 2
Ruddy duck	-	1	1	-	1	1	-
Totals	312	286	289	223	601	509	- 92

Table IV - Population per Square Mile and Species Composition - May 10-20

Species	Total Ducks *	Total Pairs **	Total *** Population	Species Composition ****
	PER SQUARE MILE			(Percent)
Mallard	67.0	53.0	106.0	44.1
B-w. teal	49.6	28.4	56.8	23.6
Pintail	15.8	12.8	25.6	10.6
Baldpate	12.0	6.4	12.8	5.3
G-w. teal	10.0	6.4	12.8	5.3
Canvasback	7.4	4.6	9.2	3.8
Lesser scaup	5.4	3.0	6.0	2.5
Shoveler	4.6	2.4	4.8	2.0
Gadwall	2.8	1.4	2.8	1.2
Ring-necked duck	1.6	0.8	1.6	0.7
Redhead	1.4	0.8	1.6	0.7
Ruddy duck	0.4	0.2	0.4	0.2
Total	178.0	120.2	240.4	100.0

* Ducks actually counted.
** Pairs counted plus lone drakes.
*** Pairs plus lone ducks multiplied by two.
**** Species composition for Columns 2 and 3.

In an effort to determine the usage of water area types, the data has been worked up on a per acre basis.

Table V - Breeding pairs by Water Area Types

	Open	Wooded	Total
Number of Water Areas	154	152	306
Acreage of Water Areas	146.3	55.6	201.9
Number of Acres Per Water Area	0.95	0.37	0.66
Number of Mallard Pairs per Acre	1.23	1.53	1.31
Number of B-w. Teal Pairs per Acre	.71	.68	.70
Number of Pintail Pairs per Acre	.33	.29	.32
Number of Baldpate Pairs per Acre	.18	.11	.16
Number of G-w. Teal Pairs per Acre	.14	.22	.16
Number of Canvasback Pairs per Acre	.14	.04	.11
Number of All Other Pairs per Acre	.25	.13	.22
Total - All Species	2.98	3.00	2.98

The above data indicate that there was very little difference in the amount of use of wooded or open areas when all species are considered. Mallards and green-winged teal used the wooded areas a bit heavier while baldpate and canvasback used the open areas more. There was very little difference in the case of the blue-winged teal. However, the heavy use of the wooded areas might be attributed to the fact that they also averaged smaller in size. It is a well known fact that breeding pair densities are greater on the smaller areas. The following table illustrates this fact:

Table V I - Pairs Per Acre by Water Area Size Classes

Size Class	Open		Wooded	
	Pairs Per Water Area	Pairs Per Acre	Pairs Per Water Area	Pairs Per Acre
0 - .5	1.01	3.99	1.18	4.11
.6 - 1.0	3.00	3.81	1.87	2.30
1.1 - 2.0	4.41	2.92	3.00	2.16
2.1 - 5.0	8.55	2.52	3.50	1.11
Average	2.82	2.98	1.09	3.00

For both open and wooded areas the number of pairs per acre for all areas up to one acre in size equals 3.72. It is interesting to compare this figure to that for 1,389 water areas censused in North and South Dakota in 1949 which yielded 3.73 pairs per acre.

There is increasing evidence each year to the effect that breeding pairs on the prairie breeding grounds tend to make maximum use of the available small water areas and spill over into less favorable or sub-marginal habitat when maximum capacity has been reached. The data suggests that these small (one acre or less) water areas were populated about to the saturation point or to carrying capacity and possibly the utilization of them may provide an index to the status of the population.

Nesting Success

One hundred and ninety-one nests were found, the locations of which are shown on the accompanying map. Nests were found while walking out the study area and also by intensive searching. Over 50 percent of the nests were found by a labrador dog. The dog became very proficient at finding both active and completed nests and after several weeks was actually pointing hens on the nests. During the middle of one cool day in June she found 8 active nests in 80 minutes, over a fairly extensive cover range.

Nest destruction of 98 nests was attributed to the following causes: Skunk, 39; crows or magpies, 32; ground squirrels, 16; other animals, 4; agriculture, 2; undetermined, 5. In addition the extremely abundant crows took many eggs from layings in which there were only one or two eggs and not enough nest construction to be found. These egg shells were scattered under aspen groves throughout the area. The above data do not include any such losses.

Table VII - Nest Data Summary - Redvers Study Area

Species	Total Found	Abandoned	Total Remaining	Destroyed	Successful	Percent Success
Mallard	133	5	128	67	61	47.6
B-w. teal	31	1	30	17	13	43.3
Pintail	7	0	7	5	2	28.5
Baldpate	5	0	5	3	2	40.0
Lesser scaup	4	0	4	2	2	50.0
Gadwall	3	1	2	1	1	50.0
G-w. teal	3	2	1	0	1	100.0
Canvasback	3	0	3	2	1	33.3
Ringneck	2	1	1	1	0	-
Total	191	10	181	98	83	45.8

Predominant types of cover in which nests were found included:

1. Snowberry patches in pastures, at the edges of cultivated fields or aspen groves and especially between roads and the adjacent fields.

2. Unplowed areas, and old fields between or adjacent to water areas. Here the cover consisted of pure stands of wheat grass in some areas and in other areas a mixture of Canada thistle, sow thistle, dandelions, and other weeds and grasses.

3. Grassy areas, usually with some Carex or other sedges, around the edges of potholes.

4. Willow growths around the edges of dried-up water areas.

Nesting success as indicated in the foregoing table was considered very good and its similarity to breeding pair - brood success suggests it to be an accurate method of measuring breeding success where the nesting density is heavy enough to make nest hunting profitable.

Brood Production

Two brood counts were made by walking around each water area. The labrador dog was used on all areas and proved to the writer's satisfaction that the success of a brood survey in such country depends largely upon the use of a good dog.

In addition to the two regular brood counts in July a record of broods was kept during the breeding pair census in June but this was not a complete brood count as not all of the areas were walked around.

The following tables illustrate the results of brood counts:

Table VIII - Redvers Study Area - Brood Census

	BROODS SEEN			Total *	Total **	Total ***
Species	June 1-6	July 1-6	July 25-29	Production	Production	Production
Mallard	43	92	95	122	136	138
B-w. teal	-	24	50	62	55	62
Pintail	8	15	9	19	21	17
Baldpate	-	10	7	12	8	7
G-w. teal	-	4	12	14	11	12
Canvasback	7	8	3	9	7	10
Lesser scaup	-	1	1	2	1	1
Shoveler	-	3	5	6	6	5
Gadwall	-	1	1	2	1	1
Ringneck	-	1	-	1	-	-
Total	58	159	183	249	246	253

* Data in this column were arrived at by counting all broods observed on July 1-6 and by adding those seen during the period July 25-29 which were judged to have hatched after July 6.

** Calculated by counting all broods seen on July 25-29 census and adding to them Class II and Class III broods from the July 1-6 census which were considered to have been able to fly by July 25. In this calculation as well as in the one above no flying broods were counted.

*** Calculated by adding Column 1 (June 1-6 data) to Column 3 (July 25-29 data).

The three methods of determining brood production are included to illustrate the fact that regardless of method, the results are practically the same.

It is extremely gratifying to note that the breeding pair-brood success of 42.4 percent compares very closely to the 45.8 percent nesting success. For the mallard it was even closer, 46.2 percent and 47.6 percent respectively. It should not be amiss to assume that both figures come very close to the actual breeding success.

Table IX - Pair-Brood Data - Redvers Study Area (5 Square Miles)

Species	Breeding Pair Census			Percent		Percent	Production
	May 10. Pairs	July 25 Pairs	Breeding Population	Species Comp.	Brood Production	Species Comp.	Percent of Pairs
Mallard	265	1	264	45.0	122	49.0	46.2
B-w. teal	142	8	134	22.8	62	24.9	46.3
Pintail	64	-	64	10.9	19	7.6	29.7
Baldpate	32	2	30	5.1	12	4.8	40.0
G-w. teal	32	2	30	5.1	14	5.6	46.7
Canvasback	23	-	23	3.9	9	3.6	39.1
Lesser scaup	15	-	15	2.5	2	0.8	13.3
Shoveler	12	-	12	2.0	6	2.4	50.0
Gadwall	7	-	7	1.2	2	0.8	28.6
Ringneck	4	-	4	0.7	1	0.4	25.0
Redhead	4	-	4	0.7	-	-	0.0
Ruddy	1	1	0	.0	-	-	-
Total	601	14	587		249		42.4

These brood data are not complete due to the fact that a few incubating hens remained on nests and of course could not be censused.

Due to the very few adult ducks seen during the final census, plus the fact that no nests were found by the dog indicates that the number of remaining hens on nests was very small so that the final success figure would certainly not be over 50 percent. There is a good possibility that breeding success for the scaup, gadwall and ringneck was higher than indicated due to their late nesting habits.

Taking into consideration both nesting and pair-brood success, a figure of 45 percent should be a conservative estimate of production. Applying this figure to the 600 pairs present in May we get a production of 270 broods with an average Class III brood size of 6.25 for a total of 1,688 ducklings. These 1,688 juveniles added to the original 1,200 adults, represents an increase of from 1,200 to 2,888 ducks which is 2.4 times the original population or an increase of 140 percent. This increase indicates a very satisfactory breeding season.

Table X - Brood Averages - Age Classes

Species	Class 0*	Class I	Class II	Class III	All	No. of Broods
Mallard	6.96	6.16	6.57	6.13	6.42	393
B-w. teal	8.87	7.97	7.34	7.25	7.94	220
Pintail	6.40	5.25	6.50	5.00	5.62	40
Baldpate	8.40	7.13	7.83	7.00	7.81	43
Canvasback	7.25	6.25	6.09	5.64	6.28	53

* Class 0 is made up of broods one week or less in age.

The above brood averages were compiled from data collected either on the study area or in the general area surrounding it. No comparable data for 1951 are available but data from the Dakotas for the mallard showed a Class III average of from 6.25 to 7.00 for the 1949-51 period and 7.25 to 7.74 for Class III blue-wings.

Table XI - Brood Data by Water Area Types

	Open Areas	Wooded Areas
Number of broods observed from July 25-29	128	55
Acreage of water remaining on July 25	138.0	38.2
Broods per acre	0.93	1.44
Acreage of occupied water areas	92.3	21.3
Broods per acre of occupied areas only	1.39	2.58

The above data indicates a higher use of wooded areas (on a per-acre basis) than for open areas. Further analyzing the data by water areas and size-classes, it was found that there was not a decidedly higher use on the very small areas by broods (as was the case for breeding pairs) so that the heavier use of wooded areas was a real one. However, this may not necessarily have been due to a preference for wooded areas but to the fact that more of the wooded areas dried up due to their small, shallow nature thus causing a heavier concentration of broods on the remaining areas. It should be explained that the wooded and open areas were not evenly distributed over the study area but instead there would be two or three miles of predominantly wooded areas then a series of open areas.

Aerial VS Ground Coverage

Aerial censuses of breeding pairs were flown on May 11 by Hawkins and Perroux and on May 24 by Lynch and Hyska. In both instances a Piper Super Cub 125 plane was used. The data compared to the ground count are as follows:

Table XII - Aerial VS Ground Counts of Total Ducks - Redvers Study Area

Species	Ground Count	Aerial Count by Observer Hawkins		Aerial Count by Pilot Lynch		Aerial Count by Observer Hyska	
	No. of Ducks	No. of Ducks	Percent Seen	No. of Ducks	Percent Seen	No. of Ducks	Percent Seen
Mallard	335	73	22	88	26	93	28
B-w. teal	248	47	19	19	8	3	1
Pintail	79	18	23	9	11	9	11
Baldpate	60	18	30	13	22	5	8
G-w. teal	50	3	6	-	-	1	2
Canvasback	37	38	103	14	38	26	70
Lesser scaup	27	5	19	8	30	16	59
Shoveler	23	5	22	6	26	3	13
Gadwall	14	4	29	4	29	8	57
Ringneck	8	2	25	2	25	-	-
Redhead	7	4	57	2	29	1	14
Ruddy duck	2	-	-	-	-	-	-
Unidentified	-	42	-	90	-	144	-
Total	809	259	29	255	29	309	35
No. of Ponds	306	297	97	295	96	294	96

From the foregoing data it is easy to see which species of ducks are the most difficult to observe from the air. Both species of teal fall in this category with the little green-wing being especially hard to see not only because of its small size but also due to its tendency to frequent the wooded ponds. Separate count of the ducks by open or wooded ponds was kept by the Hawkins-Perroux team and while they saw 29 percent of the ducks seen on the ground they only saw 14 percent of those in wooded areas and 33 percent of those in open areas. The wooded nature of the aspen parklands area is the real reason for the low percentage of ducks counted from the air. Observer Hyska did not attempt to identify all ducks as to species which made it possible for him to see a greater percentage of the total population present.

An aerial brood census made on July 17 yielded the following results:

Table XIII - Aerial Brood Data

Broods from the July 25-29 ground count	183
Estimated total production on the study area	249
Broods seen from the air	104
Percent of ground count seen from the air	57
Percent of the actual total production seen	42

Summary

To briefly summarize the data from the Redvers Study Area we can conclude that:

1. Weather and water conditions were favorable for both nesting and brood production, especially for the ground-nesting species. Ample water remained on July 30 to allow all broods to reach flying age no matter what kind of weather occurred after that date.

2. Breeding pair population was high (120 pairs per square mile) but not higher than the amount of breeding territory (number of water areas) would indicate. There were 61 water areas per square mile.

3. Nest data indicated 45.8 percent success.

4. Brood data indicated 42.4 percent success.

5. In general, the season was assumed to be considerably better than average for the area although no directly comparable ground data were available for comparison.

6. Comparisons between aerial and ground data indicated that the aerial crew was able to see between 29 and 35 percent of the pairs and lone drakes present, depending on the observer. Some species such as the teal were more difficult to see than some of the others. Regarding broods, the aerial crew recorded 57 percent of those counted by intensive ground methods.

WATERFOWL BREEDING GROUND SURVEY IN MANITOBA

Arthur S. Hawkins and Edward G. Wellein

The sixth consecutive survey of waterfowl breeding conditions in Manitoba extended from April through August, with representatives of the Canadian Wildlife Service, Manitoba Game Branch, Wildlife Management Institute, Ducks Unlimited, and the United States Fish and Wildlife Service participating. As in the past the field personnel sought quantitative information showing population trends. This information was made available to the regulating committees of Canada and the United States in two reports; the first dealing with the status of the breeding population; the second with production.

Now recognized as an integral part of the breeding ground work, a banding program again followed the production survey and will continue until freeze-up. By September 20, about 9,500 ducks had been banded, mostly this year's production, (See Table III) and the returns from these during the hunting season will further enlighten us concerning migration routes and mortality rates.

The figures used in this report were collected by:

Aerial Crew (Grumman Widgeon)
- Edward G. Wellein (U. S. Fish and Wildlife Service) Pilot
- R. D. Harris (Canadian Wildlife Service) Observer during breeding pair survey
- D. G. Colls (Canadian Wildlife Service) Observer during production survey
- Arthur S. Hawkins (U. S. Fish and Wildlife Service) Observer in northern Saskatchewan

Aerial Crew (Piper PA-18)
- J. W. Perroux (U. S. Fish and Wildlife Service) Pilot
- Arthur S. Hawkins (U. S. Fish and Wildlife Service) Observer

Ground Crew (Manitoba Game Branch Officers)
- Strata A - Officers Serafin, Henderson, Goodey, Parsons, Krentz and Johnson
- Delta and Netley Marshes - Officers Gilmore*, Shand, Schindler, and Howard
- The Pas - Officers A. Clark, G. W. Clark, Iles, Bercier, Fourre, Reader, Richards and Lambert

Ground Crew - (Special Studies)**
- W. H. Kiel (University of Wisconsin graduate student, sponsored by U. S. Fish and Wildlife Service and Wildlife Management Institute)
- C. W. Newcomb (U. S. Fish and Wildlife Service)
- G. Parsons (Manitoba Game Branch)
- S. Kolt (Manitoba Game Branch) transferred to grouse project in June
- Arthur S. Hawkins (U. S. Fish and Wildlife Service)

* Assisted by Peter Ward, Wildlife Management Institute.

** Graduate students Alex Dzubin (University of British Columbia) and E. F. Bossenmaier (University of Minnesota), both sponsored by the Wildlife Management Institute, conducted special studies on Rosneath Study Area and Whitewater Lake respectively, which will be reported separately.

Banding Crew

Arthur S. Hawkins, C. W. Newcomb, and E. N. Cole (U. S. Fish Wildlife Service)
G. P. Dellinger and M. E. Weller (University of Missouri graduate students)
Nan and Simon Mulder (Wildlife Management Institute) decoy operators

General information regarding waterfowl conditions in the northern part of the Province was provided by Manitoba Game Branch officers.

Personnel and equipment were deployed as follows: The Widgeon crew surveyed the Saskatchewan Delta and forest or tundra regions north and east of Lake Winnipeg. These flights extended beyond Manitoba east to Lake Nipigon in Ontario, northwest to Fort Smith, Northwest Territory, and northeast to Southhampton Island. The Piper crew covered the farmland area of Manitoba and eastern Saskatchewan. Findings outside Manitoba are discussed elsewhere. Game Branch ground transects have remained the same since their inception in 1948. The remaining ground work, except for general reconnaissance, was confined to the Newdale-Erickson District where W. H. Kiel has conducted special studies since 1949. (See Special Scientific Report: Wildlife No. 2 (1949), for maps showing locations of Game Branch and Kiel transects.)

Methods

A description of the aerial sampling system, methods of recording data, and a map showing the sampling pattern and strata locations are given in Special Scientific Report: Wildlife No. 13 (1951). The 1952 aerial survey differed as follows:

> Recalculations of the sampling intensity based on an additional year's data increased the distance between east-west strips in Strata A to 7 miles, in Strata B to 24 miles, and in Strata D to 10 miles. Sample size in these strata became: A--390 square miles; B--200 square miles; D--121 square miles. In Strata C, where north-south strips are found preferable to those running east-west, the sample size was 81 square miles. A production survey was conducted only in Strata A and D because very low duck densities in the other strata made brood-counting impractical. Exploratory work in the Hudson Bay Region of Manitoba is described in another section.

Standard ground survey methods were used without modification by Game Branch officers in sampling their transects. The more intensive methods used in the Newdale-Erickson District have been described by Kiel on pages 50 and 51 of the 1951 Special Scientific Report and in a following section of this publication.

Weather and Water Conditions

Weather conditions affecting waterfowl production in Manitoba during 1952 can be summarized as follows:

> 1. An unusually open winter meant little or no runoff in most parts of the Province, although there was a fair carry-over of water from the previous fall.

2. Hot, dry April winds caused abnormally high evaporation rates and a rapid disappearing of temporary water areas.

3. As the water retreated from marginal vegetation and other ponds became dry, burning, plowing, brush cutting, grazing and later mowing further reduced waterfowl habitat; especially that of diving ducks and coots.

4. Fortunately, these conditions detrimental to nesting reached a peak early in the nesting season, permitting ducks to move and renest. Despite these conditions more than the usual number of first nesting attempts were successful judging from the rash of mallard and pintail broods appearing by May 20.

5. Rains in May and June which were sufficient to insure good crops were not heavy enough to prevent a steady decline in water areas. There were local exceptions, however. Ponds in a few places were restored to maximum levels by local "cloudbursts". By August the pothole habitat in Manitoba was in the poorest condition since our surveys started, but heavy rains about September 1 insured a good carry-over of water in a large part of the Newdale-Erickson District.

6. Floods originating west of Manitoba and lasting most of the summer probably affected nesting adversely in the important Saskatchewan River Delta.

Breeding Population Trends

In 1949 Manitoba had abundant surface water while Saskatchewan had little. Apparently correlated with these conditions, Manitoba's duck population increased abruptly while Saskatchewan's shrank markedly. This year the reverse appeared true. At least part of Saskatchewan's big increase in 1952 almost certainly was from breeding stock which would have used Manitoba potholes if the habitat had been suitable. This is another example of opportunism within the duck population, a characteristic which enables these game birds to withstand adverse conditions which might destroy less mobile species.

Manitoba's decline in water areas of the pothole country (Strata A), comparing the May surveys of 1951 and 1952, was about 35 percent, and in ducks nearly as much (Tables I and II). Thus the downward trend in both water and breeding ducks starting in 1951 continued this year. Despite the general decline in Strata A, there were certain areas where habitat conditions remained good and no decline was recorded. (See Kiel's report for one such area and Table I, Transect A, for another.)

Table II shows the trend in Manitoba, not only in Strata A but in other major habitat types as well, revealing a substantial decrease in breeding stock since 1950.

Production

Production surveys were limited to Strata A and D due to the low densities prevailing elsewhere, which make brood counting impractical. Counts in Strata D were made by plane only. Broods per square mile for Strata D during the past 3 years have been:

1950 - 1.2 (156 square miles in sample)
1951 - 2.0 (156 square miles in sample)
1952 - 1.2 (183 square miles in sample)

The reduced number of broods seen this year may have resulted from flood conditions prevailing in this delta throughout the breeding season.

In Strata A both ground and aerial brood counts are available. These do not agree except that no increase is indicated this year by either set of data. The aerial figures show only a slight change in broods per square mile:

1950 - 1.9 (143 square miles in sample)
1951 - 3.2 (359 square miles in sample)
1952 - 3.1 (390 square miles in sample)

Ground data, however, show a decrease this year of about the same magnitude as the decrease in breeding stock. Evidence obtained on the ground indicated that breeding success this year was no greater than in 1951, hence, it is logical to assume that total production necessarily decreased proportionately to the decrease in breeding stock. If so, the aerial count which indicated no change was in error. Probable reason: drying up of Type C (Carex and whitetop-choked potholes) and shrinkage of water away from marginal vegetation this year made broods more readily visible from the air, distorting the count upwards.

Banding

A summary of ducks banded in Manitoba from July 10 - September 20 is given in Table I I I.

Summary

Apparently associated with deterioration of the habitat due to drought, Manitoba had about 20 percent fewer breeding ducks in 1952 than in 1951. Production lagged proportionately to the decline in breeding stock, hence Manitoba's contribution to the fall flight of 1952 should be about one-fifth less than in 1951.

About 9,500 ducks, mostly of this year's hatch, were banded prior to the hunting season.

Table I - Game Branch Ground Transect Comparisons, 1951-1952

Transect	Square Miles	Total Ducks 1951	Total Ducks 1952	Change + or -	Trend in Percent
A	20.0	919	942	+ 23	+ 2.5
B_1	41.0	1,501	559	-942	- 62.8
B_2	30.0	369	339	- 30	- 8.1
C	12.5	217	140	- 77	- 35.5
K	28.4	2,275	1,586	-689	- 30.3
N	12.0	284	0	-284	-100.0
Roblin	4.0	286	279	- 7	- 2.4
Total	147.75	5,851	3,845	-2006	- 34.3

Ducks per square mile: 1951 - 39.6; 1952 - 26.0 - Percent change 34.3

Table II - Trend in Manitoba's Breeding Duck Population, 1950-1952

(Based on Aerial Transects)

Strata	Size of Strata Sq. Miles	INDICES *		
		1950	1951	1952
A	10,368	457,229	326,592	246,758
B	28,600	297,440	165,880	143,300
C	67,628	101,442	74,390	81,150
D	3,964	162,524	78,490	74,520
	110,560	1,018,635	645,352	545,728
Percent decrease from 1950		-	37	46
Percent decrease from 1951		-	-	15

* Indices were obtained by multiplying the size of each strata by the ducks per square mile (aerial count) for that strata. No corrections have been made for phenological differences between seasons.

Table III - Summary of Waterfowl Banded in Manitoba - July 3 to September 23

Species	Adult Male	Immature Male	Adult Female	Immature Female	Total
Mallard	233	717	129	721	1,800
Black duck	26	-	2	4	32
Gadwall	-	13	1	8	22
Baldpate	1	32	1	31	65
Pintail	5	164	28	184	381
G-w. teal	7	135	14	111	267
B-w. teal	182	2,866	52	2,889	5,989
Shoveler	-	8	1	18	27
Wood duck	1	-	-	-	1
Redhead	5	417	33	510	965
Ringneck	-	2	-	1	3
Canvasback	1	17	6	15	39
Lesser scaup	-	-	1	-	1
Ruddy duck	-	-	-	1	1
Total ducks	461	4,371	268	4,493	9,593
Coots		17 Juveniles			17

WATERFOWL BREEDING POPULATION AND PRODUCTION IN THE NEWDALE-ERICKSON DISTRICT OF MANITOBA - 1952

William H. Kiel, Jr.

Waterfowl returning to this district in southwestern Manitoba for the 1952 breeding season found habitat conditions the driest since this study began in 1949. This report gives a brief account of the breeding season and makes comparisons of habitat conditions, breeding populations, and production of recent years.

The background of this study and a description of the district are given in Special Scientific Report: Wildlife No. 2 (1949), p. 76.

Personnel working on this project have been listed by Hawkins and Wellein in the 1952 Manitoba report under the heading "Ground Crew (special studies)".

Methods

Methods employed to measure trends in the breeding population and production did not differ from those described in Special Scientific Report: Wildlife No. 2 (1949), pp. 76-81, and Special Scientific Report: Wildlife No. 13 (1951), pp. 50-52.

Habitat Conditions

Water Levels

Low water levels prevailed in the district following a winter with very little snowfall and an extremely dry spring. By May 15, the mid-point of the breeding pair survey, permanency class "D" potholes were non-existent and approximately 40 percent of the "C" water areas were dry. An indication of the comparative dryness of the years 1949-52 may be seen in Table 1. The statistics are based on 120 study potholes of "B" and "C" permanency in a district which has better than average habitat in terms of semi-permanent "B" water areas.

Table I - Water Conditions, 1949-1952

Year	Potholes dry before September 1	Potholes dry July 8-25 (brood survey period)
1949	26 percent	--
1950	3 percent	--
1951	40 percent	19 percent
1952	--	45 percent

Land Use

For the second consecutive year, a wet fall prevented farmers from completing harvesting operations, and many acres of unthreshed grain were left until this spring. A dry spring speeded up spring threshing and plowing of stubble fields but at the same time left pothole marginal vegetation high and dry and susceptible to severe burning. This spring, for the first time during the course of this study, cattail cover along pothole margins was severely damaged by burning.

The spring-burning history of 120 potholes follows:

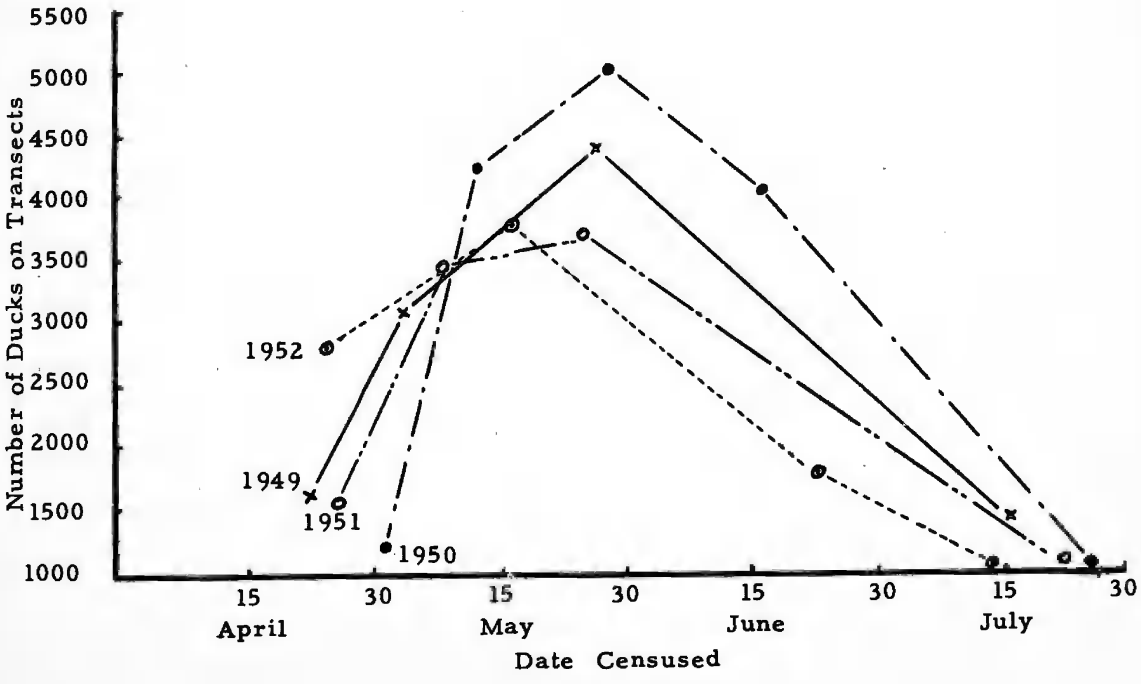
Year	Percent Burned
1950	3
1951	23
1952	29

Breeding Population

Phenology

Several transect coverages during each breeding season show differences in phenology and population numbers as illustrated in Figure 1. Events of the season, such as arrival and hatching dates, indicate that 1952 was approximately one week earlier phenologically than 1951.

Figure 1. Phenology of Waterfowl Population Newdale-Erickson District 1949 - 1952



Trends

Despite a substantial reduction in the number of water areas in the district, the total duck population did not show a decrease (Table II). Coots continued a downward trend. Their decrease since 1949 is 62 percent.

Table II - Breeding Pairs and Species Composition, Newdale-Erickson District
(12 transects - 50.4 square miles)

Species	1951 May 15 - June 2		1952 May 6 - 29	
	Pairs	Species Percent	Pairs	Species Percent
Mallard	310	17.0	398	23.9
Pintail	155	8.5	104	6.3
Baldpate	147	8.1	132	7.9
Gadwall	84	4.6	72	4.3
Shoveler	115	6.3	60	3.6
Blue-winged teal	467	25.6	357	21.5
Green-winged teal	99	5.4	88	5.3
Canvasback	49	2.7	84	5.1
Redhead	78	4.3	66	4.0
Ruddy	55	3.0	25	1.5
Lesser scaup	206	11.3	229	13.8
Others	61	3.3	48	2.9
Total	1,826		1,663	
Pairs: Total Ducks - Ratio	1:2.02		1:2.28	
Pairs per Square Mile	36.2		33.0	
Trend	--		- 8.8 percent	
Ducks per Square Mile	73.3		75.1	
Trend	--		+ 2.5 percent	
Coots per Square Mile	8.4		4.7	
Trend	--		- 44.0 percent	

Production

Trends

Production dropped 25 percent compared to 1951 with lower production of blue-winged teal and diving duck broods largely responsible for the decline (Table III). A similar trend in production was indicated by 120 study potholes.

Table III - Trends in Production and Species and Age-Class Composition of Broods, 1951-52, Determined by the Road-Count Method

(12 transects - 50.4 square miles)

Species	1951 July 9 - 22		1952 July 8 - 19	
	Broods	Species Percent	Broods	Species Percent
Mallard	91	23.7	113	39.3
Pintail	29	7.6	27	9.4
Baldpate	26	6.8	13	4.5
Gadwall	3	0.8	4	1.4
Shoveler	11	2.9	6	2.1
Blue-winged teal	49	12.8	28	9.8
Green-winged teal	6	1.6	4	1.4
Canvasback	73	19.0	46	16.0
Redhead	20	5.2	12	4.2
Ruddy duck	24	6.3	10	3.5
Lesser scaup	20	5.2	5	1.7
Others	32	8.3	19	6.6
Total	384		287	
Age Class				
I	177	46.7	110	39.0
II	86	22.7	61	21.6
III	116	30.6	111	39.4
	379 (+5 unaged)		282 (+5 unaged)	
Broods per sq. mile	7.6		5.7	
Trend	--		-25.6 percent	

Brood Sizes

Average brood sizes by age classes are given in Table IV. Some limitations in the comparison of average brood sizes are reported in Special Scientific Report: Wildlife No. 13 (1951), p. 58.

Table IV - Average Brood Sizes by Age Classes, 1949-1952

Year	Class I		Class II		Class III	
	Av. Size	No. Broods	Av. Size	No. Broods	Av. Size	No. Broods
1949	7.0	329	7.0	138	6.5	130
1950	6.5	173	5.8	71	6.3	86
1951	6.8	302	6.5	128	7.1	99
1952	7.2	166	6.4	66	7.3	67

Nesting Success

There was evidence in the form of deserted nests that receding water levels were adversely affecting the nesting success of over-water nesters. Seven

nests constructed over water but left on dry ground by receding water levels were all deserted. Table V is a comparison of nesting success for 4 years.

Table V - Nesting Success, 1949=1952

	Divers		Dabblers		Coot	
Year	Percent Success	No. Nests	Percent Success	No. Nests	Percent Success	No. Nests
1949	65.4	78	45.8	48	95.9	146
1950	71.4	35	52.4	21	92.3	65
1951	86.9	61	56.3	32	100.0	102
1952	67.9	53	50.0	48	100.0	45

Summary

The 1952 breeding season was the driest in 4 years in the Newdale-Erickson district.

Despite a substantial reduction in the number of water areas, there was no decrease in the total duck population. Coots continued their downward trend.

Production dropped 25 percent from the 1951 level. Lower production of blue-winged teal and diving ducks was largely responsible for the decline.

WATERFOWL PRODUCTION AND BEHAVIOR STUDY IN THE MINNEDOSA POTHOLE DISTRICT OF MANITOBA

Alex Dzubin

This report deals with an intensive study of waterfowl production and behavior on a pothole breeding area in central Manitoba. The project was primarily concerned with an investigation of the daily and seasonal activities of breeding birds and their broods. An endeavor was also made to determine the influences of agricultural practices upon waterfowl production.

A parallel study was carried on to investigate water loss in potholes through evaporation, since changing water levels greatly influence type, size, and surrounding characteristics of water areas.

Study Area

The study area was the same as that chosen by Evans in 1949; (In Breeding Conditions, Summer 1949, by W. F. Crissey et al, Special Scientific Report: Wildlife No. 2) (See Map), a typical block of pothole farming land having a total area of 1 and 1/2 sections. The area itself was situated in District 8 (Newdale - Erickson) and was bounded on two sides by Kiel's Transect No. II. Within the study plot were included 146 water areas, 45 of which were permanent, 42 semi-permanent and 59 of a temporary nature. The dominant vegetation of these potholes varied, depending to a great extent on previous water levels and land use. Whitetop, Fluminea festuscea, Sedge, Carex Spp., Cattail, Typha latifolia, and Bulrush Scirpus acutus, were the main dominants.

The project was initiated on May 8, and continued through the summer until the latter part of August. It is hoped to continue the study for several more summers.

Acknowledgment is made to the following people for assistance given through the course of the project: H. A. Hochbaum, William Kiel, Arthur Hawkins, Wesley Newcomb and innumerable others. Also to Mr. Stan Kolt of the University of Manitoba for his part in gathering water level data. Further acknowledgment is made to the North American Wildlife Institute, who sponsored the project; National Research Council, for summer equipment and the Manitoba Game and Fisheries Branch for living quarters.

Methods

The entire success of the project hinged on marking a sufficient number of birds in order that they could be followed through the breeding season. Hens were nest trapped and marked with aeroplane dope, colored leg bands and plastic neck bands. An attempt was made to capture drakes but this met with little success. However, two were trapped by first placing a nest-trapped female inside a small wire cage which was lowered into a clover-leaf bait trap. This phase of the work was not pursued further, but it is hoped that a refinement of the method might well be used to capture breeding drakes. Certain unmarked individuals with peculiar plumage patterns were followed in order to determine the range of pairs.

Broods were marked by injecting variously colored dyes into the eggs. This procedure was used very successfully with a hatching success of over 75 percent. It was found favorable to inject eggs with a double dose of dye right at pipping time. Colored broods, especially red and green ones, were exceedingly easy to find. Color was visible for at least three weeks and often even up to the fourth week after hatching.

Each pothole on the study area contained one water gauge, an 8-foot black spruce pole driven into the mud. Weekly readings of all the gauges were taken to determine rise and fall of water levels.

Results

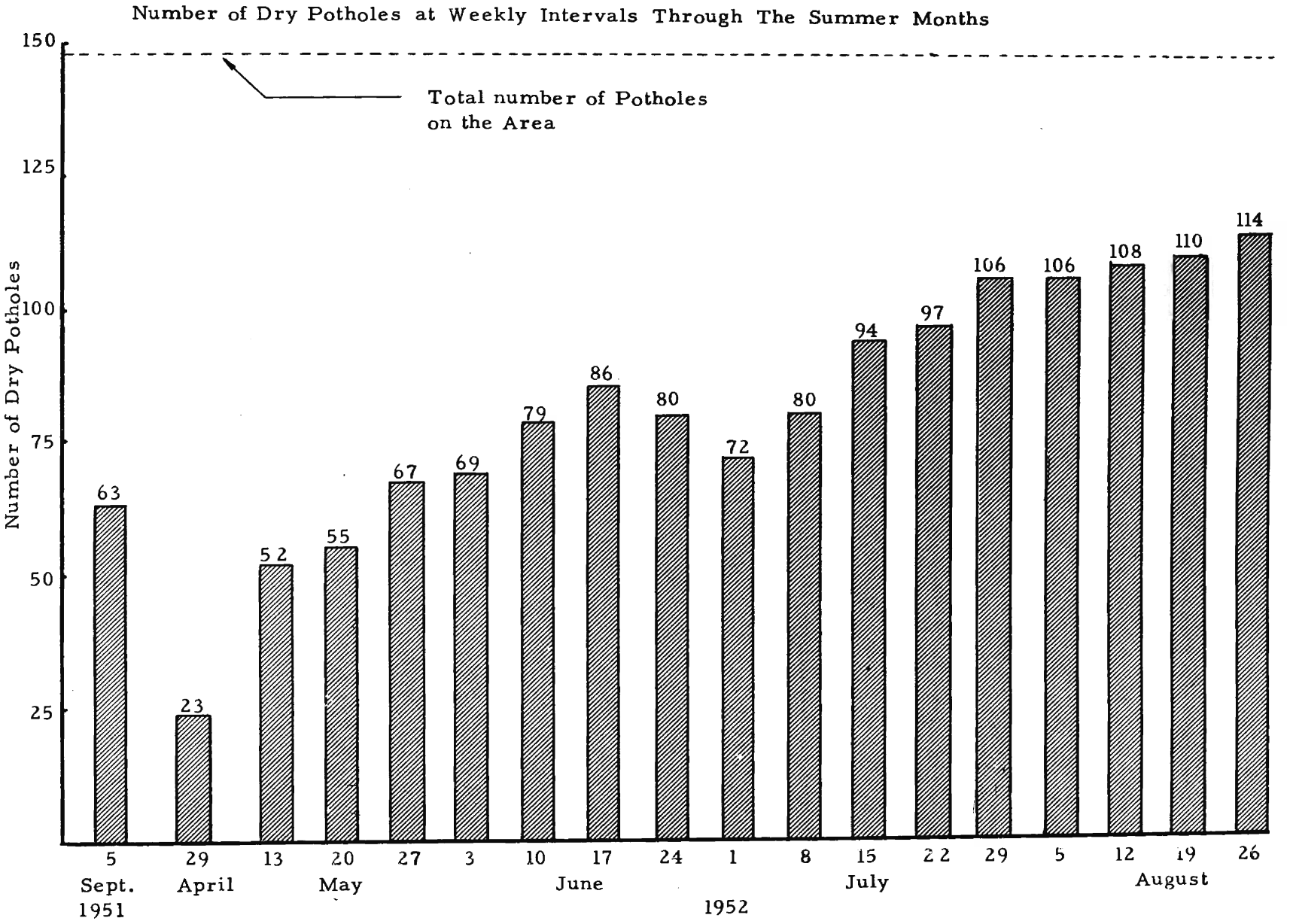
Since a sufficient number of breeding pairs was not marked, the conclusions reached regarding size of breeding pair range are all tentative and shall not be reported here. However, many observations of unmarked pairs were made and it is sufficient to say that size of breeding range varies markedly between species. Similarly, variations were noted in breeding pair ranges of the same species. This variation appears to depend on the relation of potholes to one another, topography of the land, breeding condition of the birds, and a degree of intra-species competition. The eggs of 53 nests of various species of waterfowl were injected with colored dyes. The colored broods were followed in their daily and seasonal movements and size of brood range was determined for several species. In some cases, 1 individual of the brood was trapped and remarked. The following chart gives some indication as to the size of brood ranges and number of potholes used by the brood.

Table I - Ranges of Individual Broods of Various Species

Species	Total Distance Moved (Yards)	Different Potholes Involved	Age before Flying (Days)	Original size of Brood	Mortality Hatching to Flying
Canvasback	733	4	62	9	- 2
" "	1,796	7	65	8	- 2
" "	4,473	8	58	8	0
Blue-winged teal	770	2	47	12	0
" " "	1,026	5	40	9	- 3
" " "	1,467	6	42	12	0
" " "	2,252	5	44	11	- 1
Shoveler	806	3	39 *	12	- 2
Redhead	1,576	5	66 *	10	- 3
Pintail	1,100	4	43	8	- 1

* Fully-winged but not seen flying.

Also shown in the above table is time of attainment of flight. This varied between broods and between individuals of the same brood. It was exceedingly difficult to determine the exact day of first flight, because birds might not attempt to fly during periods of observation.


Number of Dry Potholes at Weekly Intervals Through The Summer Months
Total number of Potholes on the Area
Number of Dry Potholes
150
125
100
75
50
25
63
23
52
55
67
69
79
86
80
72
80
94
97
106
106
108
110
114
5 Sept. 1951
29 April
13
20 May
27
3
10
17 June
24
1
8
15 July
22
29
5
12
19
26 August
1952

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Mortality as a rule occurred during the first two or three weeks after hatching. Causes of this mortality were, however, difficult to ascertain.

Productivity of the Area

A count of breeding pairs on the area was made during the second week of May. The number of pairs of breeding birds seen on all potholes was recorded during both the early morning and evening hours. In every case an attempt was made not to flush the birds from the water area. This count was continued for four successive days and then a definite number of pairs was assigned to each pothole. Lone drakes and lone females were counted as separate pairs. Although the census was made during a time when many of the mallard and pintail hens were incubating, there is little doubt that most were observed during the evening counts, for they generally fed in the potholes at that time.

A brood survey of the area was carried out on July 11. Each quarter section was assigned to two people and a simultaneous count of the entire area was made. The two observers walked through the emergent vegetation and surrounding grassland of all potholes on the quarter. Flushed and feigning hens were recorded as broods.

Similar data were also collected in 1950 and 1951. Data collected during the three years, are compared to the 1949 production counts of Evans (loc. cit.) in the following table.

Table II - Productivity of the Area - 1949 through 1952

Species	Pairs per square mile				Broods per square mile			
	1949	1950	1951*	1952	1949	1950*	1951	1952
Mallard	30.4	22.0		36	9.3		10.7	12.0
Blue-winged teal	17.7	27.3		20.7	6.6		7.3	11.3
Canvasback	10.8	10.7		8.0	7.3		5.3	5.3
Pintail	5.4	3.3		7.3	4.0		2.0	2.0
Baldpate	5.4	2.7		8.0	5.3		3.3	4.0
Shoveler	3.8	8.0		2.7	1.3		2.7	.7
Green-winged teal	1.5	-		3.3	1.3		2.0	1.3
Ruddy	5.4	4.0		2.7	5.3		4.0	2.7
Redhead	5.4	4.7		2.7	4.7		4.7	2.7
Gadwall	2.3	2.0		2.0	.7		1.3	.7
Scaup	-	1.3		.7	-		.7	-
Unidentified teal	-	-		-	3.3		-	-
Unidentified	-	-		-	.7		-	-
Total	88.1	86.0		94.1	49.8		44.0	42.7
Coot	-	24.7		12.7	-		31.3	10.0

* Data not comparable.

The calculated ratio of brood per pair was .45. A figure somewhat lower than that obtained by Evans in 1949. This figure may have been altered by a marked egress of broods from the area, due to the abnormally dry year or by an incorrect census of the early flying mallard and pintail broods.

Agricultural Influences

Spring burning of stubble was general in the district surrounding the study area. Due to last year's wet fall, farmers found it more convenient to burn their stubble this spring. A search of four quarter sections of burned wheat and barley stubble revealed destroyed mallard and pintail nests. Birds appeared to be somewhat reluctant to nest in stubble which was over 100 yards from water; but they did utilize stubble which was adjacent to the grasslands around potholes. The dried grass edge around potholes and the shrubbery around the aspen bluffs constituted the best available nesting cover for dabblers. However, it readily caught fire when stubble was burned and thus many nests were destroyed. Crows would generally seek out burning fields and feed upon the exposed nests.

Spring cultivating of unburned stubble exposed many nests, especially those near the adjacent pothole grasslands. Farmers as a rule, moved nests out of the way of their machinery. However, few, if any of these nests hatched successfully, because they were readily destroyed by crows and other predators.

Water Conditions

Spring runoff in the immediate vicinity of the study area was much lower than that of the previous year. Light winter snows and lighter spring rains added very little water to potholes. Of 146 potholes on the area, only 41 showed a depth increase over a reading taken on September 5, 1951. Abnormally high April and May temperatures soon dried out many of the temporary water areas and reduced depths in all others. Weekly readings of water gauges in all potholes in the area showed an almost continual drying trend through the summer months. The decrease of water depth due to evaporation appeared greater in smaller potholes. The accompanying graph gives some indication of the number of potholes which were dry at weekly periods during the time of the study.

Note that between June 17 and July 1 (see graph), 14 water areas which were previously dry, again became partially filled with runoff rain water. Rainfall during this 2-week period was 1.75 inches and the water level of all potholes was raised anywhere from .5 to 4.25 inches. It was noted that potholes which had previously gone dry did not hold much runoff rain water. This may have been due to drying and cracking of the mud forming the bottom stratum, which in turn affected the capacity of the depression to trap water.

Rainfall played a very important part in regulating water levels. It reduced evaporation to a minimum and, if heavy enough, added some water to the potholes with large drainage basins. In the latter case, heavy thunder showers added more water to potholes than did a daylong drizzly rain. Certain potholes near Minnedosa which were examined by Kiel and myself, had added as much as eight inches of water after a heavy 20-minute thunder shower. However, such occurrences are very rare and localized.

Receding water levels influenced brood movement especially if the water line was below the edge of the emergent vegetation. Concentrations of broods were noted on some of the deeper potholes as early as the middle of June. Sufficient water areas to insure a successful brood season, remained on the area throughout the season. Very few flightless broods were seen after August 20. However, it seems probable that unless there are some abnormally heavy fall rains or a superabundant snowfall this winter, many of the potholes will not contain sufficient water to hold breeding pairs in the spring.

AERIAL SURVEYS IN WESTERN ONTARIO, NORTHERN MANITOBA, NORTHERN SASKATCHEWAN, AND THE DISTRICTS OF MACKENZIE AND KEEWATIN, 1952

E. G. Wellein, D. G. Colls, and R. D. Harris

In the past it has been extremely difficult to find time during the waterfowl breeding ground surveys in Canada to visit and explore the more inaccessible areas in the Provinces and the Districts. It was not possible to make the routine surveys on the areas of high waterfowl population densities and have time left to do the exploration necessary to extend our knowledge of breeding conditions and population densities in the far north. For this reason another aircraft, a Piper Cub was used this spring on the surveys in southern Manitoba and Saskatchewan. This released the Grumman Widgeon for use in the more inaccessible areas.

The purpose of the surveys was to obtain quantitative data on waterfowl breeding population densities and distribution in a number of areas heretofore inaccessible in the Provinces and the far north, and to obtain other general information which would strengthen our knowledge of breeding conditions in these areas.

Personnel who participated in the survey work are as follows:

R. D. Harris (Canadian Wildlife Service) acted as observer on the survey work in western Ontario.

A. S. Hawkins (U. S. Fish and Wildlife Service) observer in northern Saskatchewan and the District of Mackenzie.

D. G. Colls (Canadian Wildlife Service) observer in northern Manitoba and the District of Keewatin.

E. G. Wellein (U. S. Fish and Wildlife Service) pilot observer - all areas.

Western Ontario

Waterfowl transects were flown in western Ontario on May 19 to 22, with R. D. Harris, Canadian Wildlife Service, acting as observer. An attempt was made to start this survey on May 10, but the aircraft was forced down by engine failure at Lac du Bonnet. As a result, time did not permit as extensive a survey in this area as had been planned.

Table I summarizes the results of the 652 miles of transect that was flown.

AERIAL SURVEY ROUTES IN NORTH CENTRAL CANADA - 1952

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Table I - Waterfowl Data Collected in Western Ontario

Route	Sq. Mile Surveyed	Ducks	Mal-lard	Black Duck	Scaup	Golden-eye	Mer-ganser
Manitoba Line - Sioux Lookout	35	63	3	-	22	1	23
Sioux Lookout - Armstrong	34	38	11	2	7	-	12
Armstrong via Osnaburg - Pickle Lake	27	15	1	1	4	-	5
Pickle Lake via Wright Lake Red Lake	41	76	7	16	29	-	22
Red Lake - Bell Lake	13	8	9	-	5	-	1
Bell Lake - Manitoba Line	13	38	14	-	-	4	12
Total	163	238	45	19	67	5	75
Ducks seen per square mile 1.46							
Percent by species *			21	9	32	2	36

*211 of the 238 ducks were identified by species, but some of the "scaup" may have been ringnecks.

The average density of 1.5 ducks per square mile closely approximates the average for the pre-cambrian type in Manitoba.

No comparable data are available for 1951.

Northern Saskatchewan and District of Mackenzie

This portion of the northern exploratory flights was conducted by observer A. S. Hawkins between May 28 and 31. A course was followed from Prince Albert to Fort McMurray, northeast to Livingstone Lake, northwest to Lake Athabaska, westward to Richardson Lake and then northward to Fort Smith. Where practical, data was recorded on a 1/4-mile transect basis. When necessary, transects were discontinued to permit scouting of the better waterfowl habitat. The data obtained on a transect basis showing waterfowl density and species composition are shown below in Tables II and III.

Table II - Waterfowl Densities in Northern Saskatchewan and District of Mackenzie

Transect	Square Mile	Ducks	Geese	Ducks Per Sq. Mi.
Delaronde Lake to Ile a la Crosse	25	106	1	4.2
Waterways to Livingstone Lake to Richardson Lake	94	69	7	0.7
Fort McMurray to Lac la Ronge	87	432	-	5.0
Total	206	607	8	2.9

Table III - Percent Species Composition - Northern Saskatchewan and District of Mackenzie

Species	Delaronde Lake to Ile a la Crosse	Waterways to Livingstone Lake to Richardson Lake	Fort McMurray to Lac la Ronge
Mallard	13.3	4.3	7.4
Baldpate	-	-	2.1
Pintail	0.9	-	-
Blue-winged teal	0.9	-	0.8
Ringneck & scaup	25.5	68.1	66.2
Redhead	-	-	0.5
Canvasback	-	-	3.1
Bufflehead, merganser, scoter, & goldeneye	41.5	13.2	11.2
Unidentified	17.9	14.4	8.2

A density of 4.2 ducks per square mile was recorded between Lake Delaronde and Ile a la Crosse. The mallard made up 13.3 percent of the total, while the ringneck and scaup accounted for 25.5 percent of the total. This second figure is an important observation because it substantiates the general observation that this area may be one of the more important breeding areas for the ring-necked duck.

Because of the character of the terrain the aircraft was flown at a higher altitude than usual. It was difficult, therefore, to separate the ring-necked duck from the scaup and for that reason these two species were lumped together. Occasional spot checks, however, indicated that a high percentage of these were ring-necked ducks.

The waterfowl density on the transect between Waterways, Livingstone Lake and Richardson Lake was the lowest observed during the trip (0.7 per square mile). On this transect the ring-necked duck and scaup made up 68.1 percent of the total ducks recorded.

The transect between Fort McMurray and Lac la Ronge passed through some of the best waterfowl habitat in northern Saskatchewan, and this is reflected in the figure of 5.0 ducks per square mile obtained for the strip. Again scaup and ringnecks accounted for a very high percent (66.2) of the total.

Superficially, a figure of 5.0 ducks per square mile appears low, yet northern Saskatchewan is a sizable area and the total number of ducks involved at this rate may be large. In addition, it appears to be important as a breeding ground for the ring-necked duck and scaup--two species which contribute materially to the kill, especially in Minnesota, Wisconsin and Michigan. However, the waterfowl habitat is spotty, occurring mostly as bays of large lakes and winding rivers. This type of habitat presents a difficult sampling problem.

Northern Manitoba and District of Keewatin

Dave Colls, Canadian Wildlife Service, acted as observer on this portion of the survey work which involved the country north to Churchill and Baker Lake and northeastward to, and including Southampton Island.

This summer was an exceptional year for aerial exploration in the country north of Churchill. A very early spring with unusually high temperatures resulted in an abnormally advanced season. On July 1, 1950, the bay at Eskimo Point was completely covered by heavy ice, which was not expected to break up until after July 15, but this year the bay was completely ice-free on July 7 when we flew over it, as it had been for some time. As a result, refueling was not the problem it had been in previous years because water landings could be accomplished in most places. Above Tavani the large permanent water areas were still covered by ice except along the shoreline. Open water was present, of course, on the tundra potholes. All snow was gone with the exception of the huge drifts which had built up during the winter on the southeast side of the higher hills.

Data were recorded on a 1/4-mile transect basis from Waboden northward. A direct course was followed from Waboden to Churchill. Northward from Churchill the flight path was confined to the tidal flats until Tavani was reached. From Tavani a direct course was flown across the interior to Baker Lake. For reason of safety the aircraft was flown at an altitude too high to record data between Baker Lake and Southampton Island. The course followed in the survey flights on Southampton Island are shown on the accompanying map.

Data recorded on a transect basis are shown below.

Table IV - Waterfowl Densities in Northern Manitoba and the District of Keewatin

Transect	Square Mile	Ducks	Canada Geese	Ducks Per Sq. Mile
Waboden to Churchill	81	74	-	0.9
Churchill to Eskimo Point	40	67	80	1.7*
Eskimo Point to Tavani	20	32	4	1.6
Tavani to Baker Lake	40	36	204**	0.9
Cape Kendall to Coral Harbor	30	1	-	tr.
Coral Harbor to Duke of York Bay	30	4	-	0.1
Duke of York Bay to Ell Bay	35	106	1	3.0
Ell Bay to Coral Harbor	22	13	-	0.6
Coral Harbor to Cape Kendall (via Boas River Delta)	40	0	3	0.0
Total	338	333	292	0.98

* In 1950 between Churchill and Eskimo Point a duck density of 19.8 per square mile was recorded.

** Includes one group of non-breeding adults numbering 150 observed on the Wilson River.

Table V - Species Composition of Waterfowl North from Churchill to Tavani

Species	Number	Percent
Mallard	5	3.8
Black duck	16	12.1
Pintail	33	25.0
Greater scaup	6	4.5
Old squaw	52	39.4
Eider and Scoter	20	15.2

Pintail, black duck, greater scaup, and mallard were observed only as far north as the Thaane River Delta. Of this group the pintail was most abundant (49.2 percent), and the black duck next (23.9 percent), in abundance. North of the Thaane River, both on the mainland and on Southampton Island, the only ducks observed were old squaws, scoters and eiders.

Canada geese were observed breeding in numbers in Thaane River Delta and in the vicinity of Tavani (6 broods were recorded). Two large breeding colonies of snow and blue geese were observed during this survey. One was the colony located in the delta of the McConnell River just below Eskimo Point and estimated to number about 15,000. The second colony was observed in the delta of the Boas River on Southampton Island and the number was estimated at 25,000. In both areas many broods were observed, indicating a successful hatch.

During the course of the survey 51 breeding swans were recorded on Southampton Island. One brood and a nest containing 5 eggs were also observed. Four sandhill cranes were seen between Churchill and Tavani but none were observed north of this point.

Maise Lake, above Tavani, marked the beginning of the caribou herd. From this point north along the Wilson River to a point just west of Gibson Lake caribou were present by the thousands. A total of only 12 wolves were observed attending this herd, and judging by the number of calves present, production had been good.

From the observation and experience obtained on this survey it appears that systematic sampling of this area would be very difficult and hazardous because of ice, weather, and refueling problems. Certainly only the best equipment should be used. Ducks which contribute to hunters' kill are confined to the coast and occur in comparatively small numbers as far north as the Thaane River. Although geese occur in large numbers they are no easier to cnesus by present methods here than they are on the wintering grounds.

WATERFOWL BREEDING GROUND SURVEY IN EASTERN CANADA

C. E. Addy, Walter F. Crissey, H. R. Webster and G. F. Boyer

Introduction

Both ground and aerial coverages of the Maritime Provinces were continued in somewhat the same manner as in the past. Since 1949 the principal effort has been centered in the Maritime Provinces. This year, however, the major portion of one aerial crew's time was involved in obtaining new transect data throughout eastern Canada to the north, including Ontario, Quebec and Labrador.

Walter F. Crissey and C. E. Addy (U. S. Fish and Wildlife Service) worked as an aerial team throughout the season, using a Widgeon N 744. This crew covered the Maritimes for the breeding pair survey, running most of the old transects and several new ones in Nova Scotia and New Brunswick. In addition, the Widgeon was used in the Ontario-Quebec-Labrador area, sampling the major habitat types from Anticosti Island to the Ungava Peninsula and as far west as Kapuskasing, Ontario. (See Map 1).

This survey crew began operations May 1, making transect runs first through southeastern Ontario and southern Quebec north of Montreal and Ottawa, then during the middle of May the Maritime Provinces were covered. Transects were also run between Lake St. John and Kapuskasing before the plane proceeded to Anticosti Island. Up to this point an attempt to time the survey with the receding ice line was successful. At Anticosti Island and later at Goose Bay, bad weather was instrumental in delaying the survey about two weeks. After leaving Goose Bay, the base of operations centered at Knob Lake, Quebec during the third week of June. From Knob Lake the route included Fort Chimo at Ungava Bay, and Port Harrison and Great Whale River on the east shore of Hudson Bay. From these fueling points various transects were run into the interior and along tidal shores. By July 3 the plane was at Moose Factory, Ontario. From this point on, heading southward through Kapuskasing, brood surveys were made.

H. R. Webster, G. F. Boyer (Canadian Wildlife Service) and W. S. Little, summer assistant, conducted spring and summer ground counts in the Maritimes and brood surveys by air during late June and July. Most of the flying was done in a Fleet Canuck owned and piloted by Mr. Elton Woodside of Prince Edward Island. Part of the flying in Nova Scotia was in a Cub Cruiser (piloted by Mr. Don Giffin) which was loaned by Mr. G. W. I. Creighton, Deputy Minister, Department of Lands and Forests.

Sampling Methods and Area Covered

Ground surveys, as in the past, were conducted on foot, by canoe, and by car. Individual water areas were covered as completely as possible. Ordinary cross-country transects by car are not practical.

Aerial surveys consist of both cross-country transects and shoreline coverage. The latter is restricted primarily to tidal areas.

Ground coverage for the breeding pair count included most of the important areas checked in other years. Ordinarily ground surveys contribute important data on broods, but this year aerial coverage received the major share of attention in the production survey. Webster and Boyer covered most of the important areas this year that were surveyed last year and ran several new cross-country transects and shoreline cruises.

Crissey and Addy covered the important overland and shoreline transects which were established on spring surveys in the Maritimes during the past few years. In addition, special new transects were established in the New Brunswick-Nova Scotia border area, the St. John River below Fredericton, and the highlands in southwestern New Brunswick. Only the surveys on Prince Edward Island are comparable with spring transects run last year in the Maritimes.

Since aerial coverage last year was limited to the Maritime Provinces the transects this year in Ontario, Quebec and Labrador are new although some surveys north of the Maritimes have been made in other years.

Aerial surveys north of the Maritimes in past years are as follows:

1949 - coverage of Anticosti Island and the shoreline of the St. Lawrence River west to Lake St. Peter and the Saguenay River to Lake St. John. There was also a special survey of the Ungava Peninsula by Fish and Wildlife Service personnel.

1950 - coverage of Anticosti Island and a reconnaissance of the southeastern Labrador area during July.

This year an attempt was made to sample the various major types of habitat from the Maritimes and southeastern Ontario north to Ungava and the eastern shore of Hudson Bay. The major forest types which were sampled are as follows, from south to north:

Mixed Forest: includes the Maritime Provinces and the extreme southeastern portion of Ontario and the lowlands in the St. Lawrence Valley of Quebec.

Main Boreal Forest: covers most of southern Quebec, southeastern Ontario and parts of southern Labrador.

Open Boreal Forest: covers most of central Quebec and Labrador.

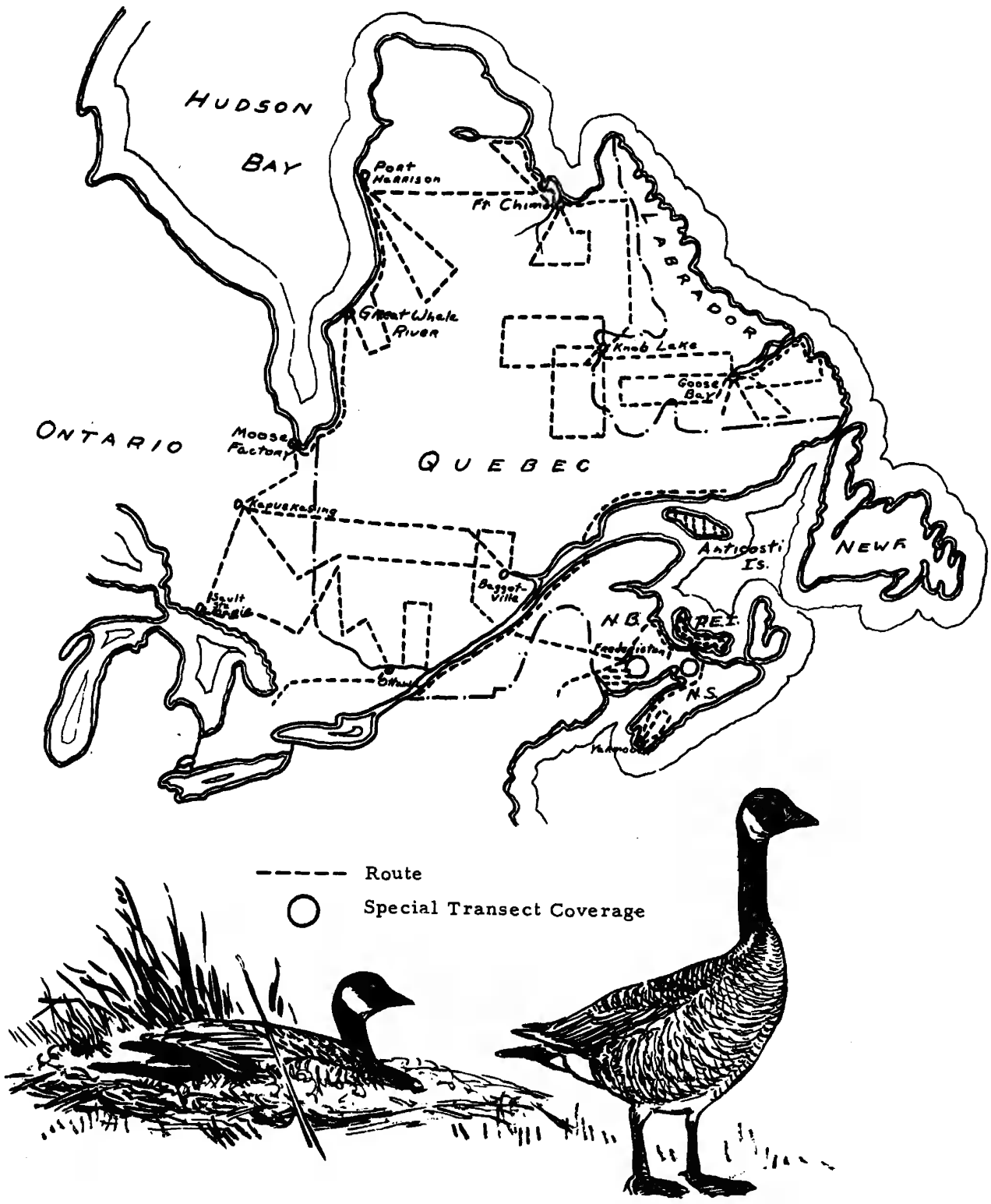
Forest-Tundra: occurs throughout much of northern Quebec and Labrador with segments locally southward.

Tundra: Restricted largely to the Ungava Peninsula and far northern Labrador. True tundra actually occurs locally well to the south at higher elevations.

For the most part the terrain of eastern Ontario, Quebec and Labrador is suitable for flying conventional cross-country transects at 100 to 300 foot elevation. Mountainous country too rough for aerial transects is located primarily along the southern edge of the Precambrian Shield in Quebec, parts of coastal Labrador and parts of northern New Brunswick and northern Nova Scotia in the Maritimes.

BREEDING GROUND SURVEY

EASTERN CANADA - 1952



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North of the height of land in Quebec the terrain is largely flat or gentle-rolling with occasional mountains cropping up. Generally speaking as one progresses northward the number of ponds and lakes increases materially until in the tundra it seems that there is nearly as much water as land. Table III gives an idea of the relative distribution of water areas in the various regions flown this year.

A most valuable aid in the surveys with the Widgeon was a Dictaphone voice recorder to which both pilot and observer had earphones and hand microphones installed. This equipment was instrumental not only in improving the accuracy and detail of observations on waterfowl but made it possible to record all caribou, moose, deer and other wildlife, describe the country traversed by transects, list the number of water areas encountered within the transects and record time at 10-minute intervals. Likewise, an Audograph Disc Recorder was used with success in the Fleet Canuck on the summer production surveys in the Maritime Provinces.

Weather and Water Conditions

Maritime Provinces

For the second successive year, water and weather conditions have been favourable for wintering and breeding waterfowl. The season was about a week to ten days later than last year.

A relatively mild winter was marked by a record-breaking snowfall received mostly during periodic storms. In some northern areas and at points of higher altitude there was still snow on the ground at the end of May. The spring break-up was later and ice did not clear from the fresh-water areas and rivers until the first week of April with most areas being open by April 15. The spring runoff was gradual and sustained, although water levels were generally higher there were no extreme flood conditions as might have been expected. Relatively low precipitation during April and early May, fairly constant temperatures and the lack of frost in the ground were no doubt beneficial. Consequently the loss of early nests to flood conditions is thought to have been at a minimum.

A cool and rainy period developed the last week of May and the first week of June and may have had some limited affect on nesting. In the St. John River System, where water levels are an important factor in nesting success, particularly with respect to ring-necked ducks, a rise of several feet during this wet spell may have flooded some nests.

The latter part of June and July were noted primarily as hot and dry with unusually clear weather.

Ontario, Quebec and Labrador

Although weather conditions vary somewhat from one part of this vast area to another, most of the territory experienced above average temperatures with ample precipitation throughout the winter and spring. The impression was gathered during the course of the survey in talking with local people that the season was retarded 10 days to 2 weeks in southeastern Quebec, whereas in the Ungava area the season was reported to be earlier than usual. It seems that the far northern areas opened at least as soon as the southern Quebec country, if not before.

The fact that a brood of black ducks was seen in the vicinity of Fort Chimo the latter part of June is probably a good indication that the season was early in the northern areas. Broods of Canada geese were commonly seen east of Port Harrison about July 1. Apparently the waterfowl which breed in the far northern part of Quebec arrive and commence nesting well before the ice is out of the major lakes in the region.

Breeding Population Trends

Since the aerial survey of the spring breeding population in the Maritimes was limited primarily to Prince Edward Island last year, the principal data available on comparable areas are from limited ground checks in the three Provinces.

Considering the three Provinces as a unit the results obtained from ground coverage are as follows:

Species	1951	1952	Percent Change
Black duck	379	430	+ 13
Blue-winged teal	80	86	+ 7
Green-winged teal	104	54	- 48
Pintail	65	27	-
Ring-necked duck	61	125	+105
Goldeneye	20	12	-
Unidentified	5	42	-
Total	714	776	+ 9

The aerial survey of Prince Edward Island, considering comparable areas only, shows as follows: (Game Ducks Only)

Species	1951	1952	Percent Change
Black duck	1,004	1,181	+ 17
Blue-winged teal	17	4	-
Green-winged teal	4	48	-
Pintail	2	4	-
Ring-necked duck	38	77	+102
Goldeneye	185	230	+ 24
Unidentified	1	7	-
Total	1,251	1,551	+ 24

These data indicate that the status of the over-all population is as good or a little improved over that of the spring population last year. Due to the small size of the samples involved, the percentages given should not be taken at face value, but only as an indication of the trend.

The bulk of the aerial data obtained this year on breeding populations in eastern Canada represents explorations into country not surveyed last year and for which we have no comparable population figures from the past. The data obtained are interesting in that they indicate relative populations between regions.

Table I shows the data broken down by Province and includes cross-country transects only.

Table II gives the same breakdown but deals with tidal shoreline coverage only.

Table III disregards Provincial boundaries and gives the data by major forest types. This table deals only with cross-country transects.

Though there remain sizable areas in eastern Canada not yet sampled, the data obtained to date suggests that there are local situations of relatively high production but the major portion of the vast territory supports a low population averaging in the neighborhood of a half to two ducks per square mile. It appears that throughout the interior, fewer ducks are encountered as one progresses north to Ungava. The figures given for ducks per square mile in the tundra (Table III) are considered too high, due to inadequate sampling. Considering the Ungava Peninsula as a unit, the duck population throughout the interior would probably not exceed a half a bird per square mile. However, higher production occurs on the tundra in the vicinity of the tidal shoreline. It is uncertain as to the width of this belt but indications are that it may extend inland 30 to 50 miles.

Table III gives the number of water areas encountered on the transects in the various forest strata. It is interesting to note the variation in number of water areas per duck, ranging from about 4 in the Main Boreal and Mixed Forests, to a high of 42 in the Forest Tundra. Although most lakes, ponds and streams in eastern Canada would be rated low as game duck habitat - those occurring north within the Pre-cambrian shield are rocky, clear watered and practically devoid of aquatic vegetation of any kind. There appears to be little there to attract game ducks.

Relatively high populations of both game and non-game ducks occur along tidal shorelines in the Ungava and Hudson Bay regions. Just what these populations represent is still problematical. It is known that a portion of the birds tallied represent a shoreline breeding population but there is also included unknown numbers of migrants. Later in the spring, during May and June or perhaps earlier, drakes accumulate along these shores. It is assumed that these represent breeding males off territory for the most part, but the size and limits of the breeding ground from which these birds originate is unknown. Only one brood and a few flying black ducks were recorded in the interior tundra, yet in the latter part of June, thousands of flying black ducks were tallied along the shore of Ungava Bay. It would seem that only through collecting and consistent observation from the ground and by air, throughout the season, would the data necessary for an interpretation of this phenomenon be obtained. Similar populations occur along most tidal areas south through the Maritimes and New England. The total number of ducks involved is large, and the problems or unknowns are of such magnitude as to warrent considerable attention.

Success of the Season

Table IV gives a breakdown by Provinces of summer production data from aerial surveys over the same shoreline areas during 1951 and 1952.

Although these are relatively limited data on which to base conclusions they do indicate a decrease in production. The percent decrease given may not indicate the true production (for New Brunswick in particular) when considering the following points. The season was a little later this year and the areas for which comparative data are available are mostly those on which the heaviest concentrations of ring-necked ducks occur. In addition to the later season this year the surveys of these areas in New Brunswick were run about one week earlier than last year in anticipation of rechecking the areas at a later date for later broods. Unfortunately, it was not possible to carry out these later surveys. Another factor undoubtedly affecting the data is that the aerial crew was not accustomed to counting waterfowl broods from a plane and much of the territory flown was unfamiliar.

Although extensive ground surveys were not attempted, information on duck broods was obtained wherever and whenever possible. During the season, data on 44 broods were collected at various points in the 3 Maritime Provinces. Complete counts were obtained on 30 of these, giving an average of 7.5 ducklings per brood. These ground counts substantiated the aerial count which showed a similar average brood size (7.6 for all species) and that the number per brood was maintained to flying stage. Last year the ground survey produced an average of 6.9 and the aerial 6.5. Apparently the higher brood success would partially offset the decrease in the number of broods recorded this year.

Table V gives a breakdown of the data obtained from limited aerial transects in Ontario and Quebec early in July. There are no comparable data from last year. The principal value of the data at this time is to acquaint the reader with the scattered nature of the population and the species encountered.

Table I - Breeding Pair Inventory Based on Cross-Country Transects

Species	Nova Scotia		New Brunswick		Ontario		Labrador		Quebec North		Quebec South	
Black duck	57	(67.1)	78	(55.7)	48	(26.4)	60	(15.8)	83	(14.0)	234	(28.5)
Mallard	-	-	-	-	-	-	-	-	-	-	-	-
Pintail	-	-	-	-	-	-	2	(0.5)	2	(0.3)	2	(0.2)
Wood duck	-	-	2	(1.4)	-	-	-	-	-	-	-	-
Blue-winged teal	-	-	-	-	-	-	-	-	-	-	-	-
Green-winged teal	-	-	-	-	-	-	8	(2.1)	17	(2.8)	8	(1.0)
Goldeneye	2	(2.3)	19	(13.6)	55	(30.2)	71	(18.7)	234	(39.2)	146	(17.7)
Ring-necked duck	14	(16.5)	25	(17.9)	4	(2.2)	2	(0.5)	4	(0.7)	17	(2.1)
Scaup	-	-	-	-	-	-	44	(11.6)	44	(7.5)	-	-
Old squaw	-	-	-	-	-	-	-	-	8	(1.3)	-	-
Merganser	12	(14.1)	16	(11.4)	75	(41.2)	186	(49.2)	158	(26.4)	416	(50.5)
Scoter	-	-	-	-	-	-	6	(1.6)	11	(1.8)	-	-
Eider	-	-	-	-	-	-	-	-	37	(6.3)	-	-
Unidentified	-	-	4	-	47	-	64	-	99	-	87	-
Total ducks	85	(100.0)	144	(100.0)	229	(100.0)	443	(100.0)	697	(100.0)	910	(100.0)
Size of sample (sq. Mi.)	76		90		196		426		725		549	
Ducks per sq. mile	1.12		1.61		1.17		1.04		0.96		1.66	
Total Game Ducks *	73		128		154		248		481		494	
Game Ducks / sq. mile	0.96		1.45		0.79		0.58		0.66		0.92	
Canada geese	-		-		-		37		392		11	
Canada geese / sq. mile	-		-		-		0.09		0.54		-	
Water Areas	399		457		1,041		7,775		19,196		3,057	
Water Areas / sq. mile	5.24		5.10		5.19		18.25		26.47		5.62	

*Excluding merganser, scoter, eider, old squaw and scaup (where not in breeding territory).

The figures in parenthesis represent percent composition.

Table II - Breeding Pair Inventory Based on Tidal Shoreline Transects

Species	Nova Scotia	New Brunswick	Prince Edward Island	Ontario	Labrador	Quebec South	Quebec North
Black duck	1,747 (84.1)	549 (36.9)	2,105 (46.3)	179 (52.3)	2,344 (71.9)	4,967 (24.9)	1,473 (28.4)
Mallard	- -	6 (0.4)	15 (0.3)	9 (2.6)	- -	13 (0.1)	4 -
Pintail	- -	6 (0.4)	8 (0.2)	22 (6.4)	29 (0.9)	447 (2.2)	78 (1.5)
Gadwall	- -	- -	- -	15 (4.4)	- -	- -	- -
Wood duck	- -	- -	- -	- -	- -	2 -	- -
Baldpate	- -	- -	2 -	- -	- -	- -	- -
Blue-winged teal	- -	4 (0.3)	6 (0.1)	77 (22.5)	- -	16 (0.1)	- -
Green-winged teal	13 (0.6)	12 (0.8)	59 (1.3)	35 (10.3)	- -	33 (0.2)	97 (1.9)
Goldeneye	46 (2.2)	207 (13.9)	255 (5.6)	- -	23 (0.7)	292 (1.5)	833 (16.1)
Ring-necked duck	17 (0.8)	421 (28.4)	117 (2.6)	- -	- -	40 (0.2)	- -
Scaup	- -	64 (4.3)	120 (2.6)	- -	- -	452 (2.2)	2 -
Old squaw	- -	- -	- -	- -	- -	4 -	8 (0.2)
Merganser	99 (4.8)	216 (14.6)	1,826 (40.1)	5 (1.5)	79 (2.4)	934 (4.7)	473 (9.1)
Scoter	136 (6.5)	- -	35 (0.8)	- -	491 (15.1)	9,712 (48.7)	1,349 (26.0)
Eider	20 (1.0)	- -	20 (0.4)	- -	294 (9.0)	3,032 (15.2)	871 (16.8)
Unidentified	16 (-)	155 -	209 -	25 -	- -	178 -	190 -
Total	2,094 (100.0)	1,640 (100.0)	4,757 (100.0)	367 (100.0)	3,260 (100.0)	20,122 (100.0)	5,378 (100.0)
Size of Sample (Lineal Mile)	364	440	560	77	250	683	478
Ducks / Lineal Mile*	5.75	3.73	8.50	4.76	13.04	29.46	11.25
Total Game Ducks	1,839	1,424	2,756	362	2,396	5,988	2,676
Game Ducks per Lineal Mile	5.05	3.24	4.92	4.70	9.57	8.76	5.59
Canada geese	77	512	102	2	76	5,774	10
Snow & Blue geese	-	-	-	-	-	9,076	-
Brant	450	6	1,889	-	-	930	11

* Excluding merganser, scoter, eider, old squaw and scaup (where not in breeding territory).

The figures in parenthesis represent percent composition.

Table III - Summary of Breeding Ground Data by Forest Types *

Forest Strata	Lineal Miles	Square Miles	Total Ducks	Total ** Game Ducks	Black Duck	Goldeneye	Merganser	Canada Geese	Water Areas
Tundra	733	184	342	266	19	180	31	287	5,368
Per Sq. Mi.	-	-	1.86	1.45	0.10	0.98	0.17	1.53	29.17
Forest Tundra	926	232	164	116	37	22	46	12	6,944
Per Sq. Mi.	-	-	0.71	0.50	0.16	0.09	0.19	0.05	29.85
Open Boreal	2,780	696	606	327	85	97	259	102	13,388
Per Sq. Mi.	-	-	0.87	0.47	0.12	0.14	0.37	0.14	19.23
Main Boreal	2,032	509	848	431	205	135	404	65	3,183
Per Sq. Mi.	-	-	1.67	0.85	0.40	0.26	0.79	0.13	6.59
Boreal - Mixed	2,155	542	615	470	228	106	145	-	2,581
Per Sq. Mi.	-	-	1.13	0.87	0.42	0.19	0.27	-	4.76

* Includes Cross-Country Transects only.

** Excludes scoter, eider, merganser and scaup (in areas where breeding does not occur).

Table IV - Aerial Production Survey on Comparable Areas in the Maritime Provinces -- 1951-1952

Area	Black		Ringneck		B-w. teal		G-w. teal		Pintail		Goldeneye		Other * Unidentified		Total	
	Adult	Brood	Adult	Brood	Adult	Brood	Adult	Brood	Adult	Brood	Adult	Brood	Adult	Brood	Adult	Brood
Nova Scotia																
1951	433	31	-	-	12	1	23	-	-	-	-	-	-	-	468	32
1952	265	12	-	-	-	-	2	1	-	-	-	-	1	3	268	16
Percent	- 39	-61	-	-	-	-	-	-	-	-	-	-	-	-	- 43	- 50
P. E. I.																
1951	358	25	35	-	29	2	46	-	8	-	2	-	14	2	492	29
1952	280	22	13	2	27	1	8	-	6	1	16	-	29	2	379	28
Percent	- 22	-12	-	-	-	-	-	-	-	-	-	-	-	-	- 23	- 3
New Brunswick																
1951	146	21	64	7	-	4	10	-	-	-	17	-	70	9	307	41
1952	138	13	35	3	2	-	-	-	2	-	6	1	12	1	195	18
Percent	- 5	-38	-	-	-	-	-	-	-	-	-	-	-	-	- 36	- 56
TOTAL																
1951	937	77	99	7	41	7	79	-	8	-	19	-	84	11	1,267	102
1952	683	47	48	5	29	1	10	1	8	1	22	1	42	6	842	62
Percent	- 27	-39	-51	-	-29	-	-87	-	-	-	-	-	-	-	- 33	- 39

*Excluding mergansers, eiders and scoters.

Table V - Production Inventory Based on Cross-Country Transects

Species	Eastern Ontario			Southern Quebec		
	Adult	Broods	Percent *	Adult	Broods	Percent
Black duck	24	7	44.4	18	5	30.5
Blue-winged teal	2	-	3.8	-	-	-
Ring-necked duck	4	-	7.4	3	-	5.1
Goldeneye	-	-	-	2	-	3.4
Scaup	-	-	-	2	-	3.4
Merganser	24	-	44.4	34	1	57.6
Unidentified	25	2	-	41	4	-
Total	79	9	100.0	100	10	100.0

Size of Sample (sq. mi.)	162	157
Ducks per Square Mile	0.48	0.64
Broods per Square mile	0.05	0.06
Total Game Ducks	51	68
Game Ducks per Square Mile	0.31	0.43
Game Duck Broods / sq. mi.	0.05	0.05
Canada geese	4	-
Water Areas	1,098	773
Water Areas per Square Mile	6.77	4.92

* Percent Composition - Adults Only.

WATERFOWL BREEDING GROUND SURVEY IN THE PROVINCE OF QUEBEC

John S. Tener and Louis Lemieux

The breeding population survey was conducted for the 4th consecutive year in the Province of Quebec in 1952. The brood survey was initiated in 1951, and repeated this year.

The breeding population survey was carried out by John S. Tener of the Canadian Wildlife Service and Gaston Moisan of the Quebec Department of Fish and Game. The areas surveyed were the same as last year: Lochaber Bay and Carillon Island and Bay on the Ottawa River; the South River Bird Sanctuary; the west end of Lake St. Peter; the south shore of the St. Lawrence River from Montmagny to Matane. The survey was made from May 9 to May 16, 1952.

The brood survey was made by Louis Lemieux of the Canadian Wildlife Service and Gaston Moisan. The areas studied were the south shore of the St. Lawrence River from Montmagny to Matane and the west end of Lake St. Peter. The brood survey was conducted from July 2 to July 6.

The areas studied during both surveys have been described in past reports.

Weather and Water Conditions

Spring was about normal in the southern part of the Province, and approximately 7 days later than in 1951. Water levels were high when the breeding ground survey was made and normal at the time the brood survey was conducted. Migration dates were also normal in 1952. Conditions were favourable for nesting.

Survey Methods

The areas studied were covered by automobile, canoe, and on foot. The aerial survey was not made this year.

Data Collected

The data collected appear in table form at the end of this report. The results of the breeding ground survey and of the brood survey are discussed separately.

Breeding Population Survey

The results produced by the breeding population survey in the Province of Quebec appear to have little significance. The areas studied are not good breeding grounds, except for the Montmagny to Matane shore line, where eiders nest. We have been unable to locate a region where waterfowl concentrate to nest in significant numbers in this Province. In Lake St. Peter, where large numbers of waterfowl are observed during migrations, it is likely that an important change in waterfowl populations would be noticed, but the method of observing would not reveal slight variations. The brood survey has shown that only small numbers of ducks nest in the areas studied, with the exception of the Montmagny-to-Matane region. The results of this survey are recorded in Tables I and II.

Brood Survey

The survey of the west end of Lake St. Peter did not yield significant results. However, the Montmagny-to-Matane region supports large numbers of nesting eiders. (See Table III.)

The brood survey was made 10 days later this year than in 1951 and better results were obtained. We saw more broods and less male eiders. Broods of eiders mix together, probably for protection, and quite often we found as many as 40 young birds together with 4, 5 or more adults. At other times we noted broods containing more old birds than young, which may indicate that yearlings stay with the adult females and broods. Since we cover an extensive length of shoreline from Montmagny to Matane, it may be assumed that the number of yearling birds seen each year with the broods is constant. The ratio "young per adult" may then be said to be more reliable than the ratio "young per brood" since the former will remain the same if 2 broods join together while the latter would be affected.

It appears from the results that the nesting success for eiders has been slightly better in the St. Lawrence this year than last year.

Table I - Results of Breeding Population Survey - 1952

Species	Carillon Island and Bay			Lochaber Bay		
	Pr.	Ind.	Total	Pr.	Ind.	Total
Mallard	-	2	2	1	1	3
Black duck	-	-	-	-	10	10
Pintail	-	-	-	1	-	2
Baldpate	-	-	-	-	1	1
Blue-winged teal	-	1	1	-	-	-
Ring-necked duck	-	-	-	2	16	20
Lesser scaup	1	-	2	-	-	-
Common goldeneye	-	2	2	-	-	-
Bufflehead	-	-	-	-	1	1

Table I -(Continued)

	Lake St. Peter			South River		
	Pr.	Ind.	Total	Pr.	Ind.	Total
Mallard	6	1	13	-	-	-
Black duck	13	235	261	3	8	14
Pintail	4	6	14	-	-	-
Green-winged teal	5	-	10	-	-	-
Blue-winged teal	13	6	32	-	-	-
Shoveler	2	-	4	-	-	-
Wood duck	-	-	-	3	-	6
Ring-necked duck	-	-	-	3	-	6
Lesser scaup	22	127	171	-	-	-
Common goldeneye	16	5	37	1	-	2
Bufflehead	-	1	1	-	-	-

Table I - (Continued)

Species	Montmagny to Riviere-du-Loup			Riviere-du-Loup to Matane		
	Pr.	Ind.	Total	Pr.	Ind.	Total
Canada geese	-	1,052	1,052	-	142	142
Brant	-	912	912	-	2,051	2,051
Snow geese	-	15,000	15,000	-	-	-
Blue geese	-	13	13	-	-	-
Mallard	-	1	1	-	-	-
Black duck	8	70	86	1	15	17
Pintail	14	-	28	-	-	-
Green-winged teal	3	-	6	2	1	5
Lesser scaup	15	-	30	-	1	1
Common goldeneye	2	-	4	32	-	64
Barrow's goldeneye	-	-	-	34	46	114
Old squaw	-	-	-	27	-	54
Common eider	30	3	63	665	383	1,713
Surf scoter	3	-	6	44	83	171

Table II - Total Waterfowl Observed During Breeding Population Surveys

Species	1952	1951
Greater snow geese	15,000	9,330
Blue geese	13	114
Canada geese	1,194	100
Brant	2,963	2,705
American eider	1,776	3,764
Black duck	388	1,022
Lesser scaup	204	1,519
Blue-winged teal	33	59
Mallard	17	54
Pintail	44	32
Wood duck	6	8
Bufflehead	3	7
Surf scoter	178	495
White-winged scoter	0	8
American scoter	0	4
Barrow's goldeneye	114	24
Common goldeneye	109	138
Old squaw	54	32
American merganser	131	13
Red-breasted merganser	26	12
Green-winged teal	21	2
Ring-necked duck	26	0
Baldpate	1	0
Shoveler	4	0
Total	22,305	19,442

Table III - Brood Count Along the South Shore of the St. Lawrence River

	EIDERS			
	Males	Females	Total	Broods
From Montmagny to Riviere-du-Loup:				
1952 -	0	170	170	64
1951 -	No Eiders seen.			
In 1951 no broods were seen.				
In 1952, 64 broods contained 101 adults (3.8 young per adult				
391 young : (6.1 young per brood				
From Riviere-du-Loup to Sainte-Flavie:				
1952 -	14	463	477	169
1951 -	334	455	789	43
In 1951, 43 broods contained 119 adults and (3.6 young per adult				
431 young: (10.0 young per brood				
In 1952, 169 broods contained 333 adults and (3.9 young per adult				
1,324 young: (7.8 young per brood				
From Sainte-Flavie to Matane:				
1952 -	20	187	207	10
1951 -	242	269	511	3
In 1951, 3 broods contained 7 females and (2.4 young per adult				
17 young: (5.6 young per brood				
In 1952, 10 broods contained 31 adults and (2.3 young per adult				
73 young: (7.3 young per brood				
Total from Montmagny to Matane:				
1952 -	34	818	852	242
1951 -	576	724	1,300	46
In 1951, 46 broods contained 126 adults and (9.7 young per brood				
448 young: (3.5 young per adult				
In 1952, 242 broods contained 465 adults and (7.3 young per brood				
1,788 young (3.8 young per adult				

Other birds seen in 1952: 12 Surf scoters, 6 American mergansers, 5 American goldeneyes.

West End Lake St. Peter:

5 broods of American goldeneyes were seen, against 4 last year.

WATERFOWL BREEDING GROUND SURVEY IN SOUTHERN ONTARIO

George M. Stirrett

Introduction

A survey of waterfowl breeding grounds in southern Ontario was carried out during the summer of 1952 to measure the current status of waterfowl in the area and to add to the knowledge of yearly population trends and breeding success.

This report gives the results of three independent surveys undertaken by the author and by Messrs. H. G. Lumsden and N. D. Patrick of the Fish and Wildlife Division, Ontario Department of Lands and Forests. These men have kindly furnished the author with a copy of their respective reports for use in the present compilation.

The author examined 39 separate water areas, one or more times, in that portion of Ontario lying south of a line drawn from Sault Ste. Marie in the west to Sudbury, Timagami, Arnprior and Cornwall in the east. This was the same area reported upon last year. This survey was made between May 20 and July 15. In carrying out this work approximately 5,500 miles were travelled by car, 148 by boat, and 45 miles on foot.

Mr. Lumsden examined 16 areas in the Quinte district of southern Ontario between July 7 and 22, and Mr. Patrick examined 3 habitats during May in the Rideau district of southeastern Ontario. Both the Quinte and Rideau districts are within the larger southern portion of Ontario examined by the author, but there was no overlap in the examination in the water areas by each observer. A total of 58 habitats were examined.

The spot method of sampling was employed by each observer. Mr. Patrick and the author made their observations by canoe, car or on foot or a combination of these methods of transportation, and Mr. Lumsden carried out both a ground and aerial survey in his district. The techniques employed were similar to those used in previous years.

Weather and Water Conditions

In general the season was warmer and drier than for the past few years. No drought areas were experienced as precipitation was evenly distributed throughout the spring and summer. All inland marshes, lakes and ponds were well supplied with water. The water in the Great Lakes and a large number of marshes directly connected with them was extremely high. Nesting and brood raising conditions throughout the area appeared to be ideal. It is not known whether or not the extremely high water in the Great Lakes and adjacent marshes had an adverse affect on waterfowl in those areas.

Breeding Population Trends

On the 58 habitats examined a total of 1,358 individual waterfowl, including young, were observed. Of the 19 species of waterfowl using these habitats, only 16 species were considered to be breeders.

Table I - List of Breeding Waterfowl Observed

Species	Number Observed 1952	Numerical Rank 1952	1951
Mallard	111	5	5
Black duck	356	1	2
Baldpate	10	11	11
Pintail	2	15	11
Green-winged teal	2	15	13
Blue-winged teal	137	3	1
Shoveler	5	14	12
Wood duck	79	6	8
Ring-necked duck	301	2	7
Lesser scaup	43	9	6
Common goldeneye	112	4	3
Bufflehead	10	11	13
Ruddy duck	8	13	9
Hooded merganser	34	10	10
Common merganser	65	8	7
Coot	66	7	4

Table I shows that there was very little change in the relative numbers, indicated by numerical rank, of the various species of breeding waterfowl in southern Ontario in 1952 as compared to 1951. The ring-necked duck showed a considerable increase in numbers and in rank (this can be explained by the fact that this year the survey conducted by Mr. Lumsden included for the first time 90 percent of the best known breeding grounds of this species in Ontario.) There is no doubt that the ring-necked duck is increasing in numbers in Ontario, as Mr. Lumsden's survey showed, but its elevation in status in the above table is largely due to the inclusion of the results of a survey not available during 1951.

Comparable data, secured in 1951 and 1952 on 28 of the habitats examined by the author and on several examined by Lumsden, show that there has been little change in the breeding status of the waterfowl using these habitats during the two years.

Of the species for which the following table shows comparative data for 1951 and 1952, the black duck, hooded merganser and the common merganser had greater success in number of young per brood during 1952 than in 1951. Broods of wood duck and common goldeneye were smaller this year than in 1951.

Success of the Season

The following table gives a record of the broods observed:

Table II - Brood Records

Species	No. Broods	Total No. Young in Broods	Average Brood Size 1952	1951
Mallard	19	109	5.7	-
Black duck	37	232	6.3	5.4
Blue-winged teal	9	78	8.6	-
Wood duck	19	110	5.8	7.6
Ring-necked duck	58	309	5.3	5.9
Common goldeneye	22	113	5.1	7.3
Hooded merganser	3	22	7.1	5.3
Common merganser	11	70	6.0	4.2
Coot	2	6	3.0	3.3

Summary

In southern Ontario, an extensive survey of breeding waterfowl conditions was carried out by the author. More restricted and local surveys were carried out by Messrs. H. G. Lumsden and N. D. Patrick of the Fish and Wildlife Division, Ontario Department of Lands and Forests in the Quinte and Rideau districts of southern Ontario. The results of all three surveys are summarized in this report.

Weather and water conditions throughout the area were ideal for waterfowl nesting and brood rearing.

In all, 58 habitats were examined by the 3 observers. Nineteen species of waterfowl were found in the area, but only 16 of these are classed as breeders. There was little change in the relative populations of the various breeding species. Black duck, blue-winged teal, ring-necked duck, common goldeneye, mallard and wood duck are the important breeders.

Brood production was about normal but there was some indication that black duck, hooded merganser and common merganser produced larger broods than in 1951. Wood duck and common goldeneye broods were smaller than in 1951.

WATERFOWL BREEDING GROUND SURVEYS OF DUCKS UNLIMITED (CANADA) IN ALBERTA, SASKATCHEWAN, AND MANITOBA

1952

William G. Leitch

This report deals only with the ground transect work carried out by Ducks Unlimited and the data obtained from two study areas in Alberta, and two in Saskatchewan. The study areas covered and the men who conducted the surveys are as follows:

Suffield - Jenner Area, Alberta - Fred Sharp and William G. Leitch
Strathmore - Calgary Area, Alberta - George Freeman and William G. Leitch
Caron Pothole Area, Saskatchewan - William G. Leitch
Southey Area - Saskatchewan - R. T. Sterling

Information obtained from Keeman cooperators and the annual survey of northern areas has been published in the "Duckological," which is issued monthly during the waterfowl season.

Transects, using standard techniques, were run in May to establish the number of breeding pairs present. The same transects were rerun about July 15 to obtain information on water conditions.

Breeding Population Trends

Results of Transects

Alberta

Area - Calgary South (Western Short Grass Prairies)

(Via: Strathmore, Mossleigh, Macleod, Pincher Creek, Waterton, Cardston, Macleod, Kepp, Vulcan, Milo, Grants, Hussar.)

	1951	1952
Size of sample - square miles	43	40
Breeding pairs per square mile - May	15.2	22.8
Ponds per square mile - May	4.9	6.6
Ponds per square mile estimated to last all season on July 15	3.3	2.7

Area - Calgary North (Western Short Grass Prairies)

(Via: Hussar, Morrin Watt, Endiang, Ranching, Big Valley, Stettler, Delburne, Innisfail, Olds, Sundre, Radnor, Calgary.)

Size of sample - square miles	40	39
Breeding pairs per square mile - May	15.1	20.7
Number of water areas per sq. mile - May	7.8	10.8
Number of water areas expected to last all season on July 15 - square miles	6.1	3.5

Area - Tilley South (Eastern Short Grass Prairies)

(Via: Brooks, Taber, Lethbridge, Del Bonita, Pakowki, Seven Persons, Medicine Hat, Tilley.)

	1951	1952
Size of sample - square miles	36	36
Breeding pairs per square mile - May	11.9	18.0
Number of water areas per sq. mile - May	3.6	7.4
Number of water areas expected to last all season on July 15 - square miles	2.5	2.6

Area - Tilley Northeast (Eastern Short Grass Prairies)

(Via: Suffield, Jenner, Empress, Cereal, and Hanna to Tilley.)

Size of sample - square miles	38	35
Breeding pairs per square mile - May	33.1	29.1
Number of water areas per sq. mile - May	4.9	9.5
Number of water areas expected to last all season on July 15 - square miles	3.7	4.0

Area - Hanna Northeast (Parklands)

(Via: Cereal, Consort, Czar, Killam, Hanna.)

Size of sample - square miles	29	26
Breeding pairs per square mile - May	42.9	24.8
Number of water areas per sq. mile - May	7.7	13.0
Number of water areas expected to last all season on July 15 - square miles	6.3	7.4

Area - Tofield Southeast (Parklands)

(Via: Tofield, Wainwright, Vermilion, Two Hills, Ranfurly, Hilliard, Tofield.)

Size of sample - square miles	34	34
Breeding pairs per square mile - May	5.9	5.9
Number of water areas per sq. mile - May	2.9	2.5
Number of water areas expected to last all season on July 15 - square miles	1.7	1.5

Area - Tofield Southwest (Parklands)

(Via: Tofield, Camrose, Bashaw, Ponoka, Thorsby, Leduc, New Serepta.)

Size of sample - square miles	27	27
Breeding pairs per square mile - May	3.0	4.3
Number of water areas per square mile - May	1.8	2.6
Number of water areas expected to last all season on July 15 - square miles	.6	1.4

Area - Tofield North (Aspen Forest)

(Via: Mundare, Willingdon, Kaleland, Lafond, Ashmont, Vimy, Edmonton.)

	1951	1952
Size of sample - square miles	26	24
Breeding pairs per square mile	3.3	5.0
Number of water areas per sq. mile - May	1.4	1.3
Number of water areas expected to last all season on July 15 - square miles	.8	.9

Summary

Total Provincial sample - square miles	273	261
Breeding pairs per square mile	16.4	17.1

The transects indicate a gain in the number of breeding pairs in the Calgary area and southern part of the Province. A small loss is apparent in the area north-east of Tilley and a considerable reduction in the aspen parklands north and east of Hanna which was exceptionally heavily populated in 1951. Populations to the north, in the more heavily wooded areas, were almost unchanged, as was the over-all Provincial average.

The number of water areas per square mile in May was somewhat greater than in 1951. Some of the increase was due to inclusion of more of the smaller types than had been done in previous years, roadside ditches, etc. The July transects showed water to be sufficient in all areas to bring the duck crop to maturity.

Saskatchewan

Area - Swift Current Southwest (Eastern Short Grass Prairies)

(Bounded on the north by No. 1 Highway, east by No. 4 Highway, and on the south and west by the U. S. and Alberta borders.)

	1951	1952
Size of Sample - square miles	14	14
Breeding pairs per square mile - May	8.1	16.7
Number of water areas per sq. mile - May	11.1	8.8
Number of water areas expected to last all season on July 15 - square miles	2.4	5.8

Area - Swift Current north to South Saskatchewan River (Mixed Prairie)

(Bounded south by No. 1 Highway, east by No. 4 Highway, west by Alberta border, and north by the South Saskatchewan River.)

Size of sample - square miles	20	20
Breeding pairs per square mile - May	17.0	25.9
Number of water areas per sq. mile - May	15.3	11.2
Number of water areas expected to last all season on July 15 - square miles	4.7	4.4

Area - North of South Saskatchewan River west of Highway No. 4 (Mixed Prairie)

(Bounded by the South Saskatchewan River on the south, on the north by Township 34, on the east by Highway No. 4, and on the west by the Alberta border.)

	1951	1952
Size of sample - square miles	16	16
Number of breeding pairs per sq. mile - May	13.5	36.0
Number of water areas per sq. mile - May	15.1	15.6
Number of water areas expected to last all season on July 15 - square miles	5.2	5.4

Area - North of No. 1 Highway, east of Highway No. 4 (Swift Current Area) (Mixed Prairie)

(Bounded by No. 1 Highway on the south, No. 4 on the west, on the north by Township 34, and on the east by Range 1, west of 3rd.)

Size of sample - square miles	25	23
Breeding pairs per square mile - May	11.2	27.5
Number of water areas per sq. mile - May	14.5	15.6
Number of water areas expected to last all season on July 15 - square miles	5.7	4.8

Area - Swift Current East (Mixed Prairie)

(Bounded by Highway No. 1 on the north, on the west by No. 4 Highway, on the east by Range 1, west of 3rd, on the south by the U. S. Border.)

Size of sample - square miles	11	11
Breeding pairs per square mile - May	11.2	20.4
Number of water areas per sq. mile - May	11.7	6.1
Number of water areas expected to last all season on July 15 - square miles	5.1	4.6

Area - Wynyard Southeast (Aspen Parkland)

(Bounded on the north by Township 34, east by the Manitoba boundary, south and west by No. 6 Highway to Regina, thence by railroad south and east to Stoughton and Carlyle.)

Size of sample - square miles	37	20
Breeding pairs per square mile - May	8.8	11.0
Number of water areas per sq. mile - May	38.2	18.0
Number of water areas expected to last all season on July 15 - square miles	10.0	4.4

Area - Wynyard Southwest (Mixed Prairie)

(Bounded on the north by Highway No. 14, west by Range 30, west of 2nd, east by Highway No. 6 to Regina, thence the railroad line south and east to Stoughton and Carlyle, and the Manitoba border.)

Size of sample - square miles	24	15
Breeding pairs per square mile - May	13.2	19.3
Number of water areas per sq. mile - May	28.8	15.7
Number of water areas expected to last all season on July 15 - square miles	7.4	3.1

Area - Wynyard North (Spruce Aspen Forest)

(Bounded on north by the Melfort-Tisdale railroad line, on the east by the Manitoba boundary, on the west by Range 30 west of 2nd, and on the south by Township 34.)

	1951	1952
Size of sample - square miles	17	no comparative
Breeding pairs per square mile - May	4.4	data
Number of water areas per sq. mile - May	27.5	
Number of water areas expected to last all season on July 15 - square miles	4.6	

Summary

Total Provincial sample - square miles	164	161
Breeding pairs per square mile	10.9	30.1

The transects indicate a Provincial increase in the number of breeding pairs of almost 200 percent. The greatest gains were registered in the western half of the Province, particularly in the area south of Swift Current and in the Kindersley district. May water conditions were similar to 1951 in the western part of the Province but the number of ponds was reduced in the east. July 15 transects showed sufficient water to be present in all areas to carry the duck crop through to maturity. In the western part of the Province, sufficient water is present to produce a duck crop for 1953. The eastern part, however, will require a good spring runoff.

Manitoba

Area - Northern (Aspen Parkland

(North of No. 1 Highway, West of Portage la Prairie.)

Size of sample - square miles	26	30
Breeding pairs per square mile - May	40.9	30.6
Number of water areas per sq. mile - May	5.1	7.8

Area - Southern (Prairie)

(South of No. 1 Highway, West of Portage la Prairie.)

Size of sample - square miles	30	31
Breeding pairs per square mile - May	19.2	15.0
Number of water areas per sq. mile - May	4.1	2.6

Summary

Total Provincial sample - square miles	56	61
Breeding pairs per square mile	29.3	22.7

Special Study Areas

Suffield - Jenner Area, Alberta

This study area was selected as typical of the unirrigated short grass plains of southern Alberta. The area was laid out as a continuous transect, beginning at the town of Suffield and running due north thirty-three miles to Jenner. The southerly twenty-three miles passes through rangeland, grazed on the west, but ungrazed on the east. The northern portion of the transect is cultivated.

Three runs were made in May to establish the breeding population, the results of which are given below. The U. S. Fish and Wildlife Service worked the area by air on May 13 and 26 for correlation with ground data of the same approximate dates. An intensive brood count was made on July 15 both by air and ground.*

The area is typcial and will be retained as a permanent study area. Good counts of territorial pairs can be obtained up to the end of May after which time the emergent vegetation begins to interfere. Intensive brood counts can be made only on the west side of the road for the first twenty-three miles. The east side is controlled by the Canadian Defense Board and trespassing is forbidden. A July 15 brood count in this area has little significance since by that date most pintail and many mallard broods are flying and have departed. The brood count was made for correlation with the aerial coverage.

Table I - Number of Breeding Pairs**- Suffield - Jenner Area

Species	May 5	May 13	May 28
Pintail	165	199	201
Mallard	47	23	59
Blue-winged teal	28	35	40
Shoveler	32	49	59
Scaup	22	12	30
Gadwall	12	5	8
Baldpate	9	23	7
Redhead	2	6	3
Cinnamon teal	2	-	-
Green-winged teal	1	4	1
Canvasback	-	1	1
Total	320	357	409
Pairs per square mile	38.0	42.5	48.6

*See report covering other intensive ground studies in Alberta by Allen G. Smith for results of aerial versus ground data comparisons both for Suffield - Jenner area and Strathmore - Calgary area which follows.

**Number of breeding pairs is sum of observed pairs and territorial drakes.

Table II - July 15 Brood Count - Suffield-Jenner Area

Species	Class I	Class 2	Class 3	Female Seen Only
Pintail (25 broods)	-	8, 11, 10, 2, 6, ?, ?	?, ?	16
Blue-winged teal (18 broods)	-	9, 12, 14, 7, 10, 8, 9, 10, 7, 7, 10, 8, ?	6	4
Shoveler (7 broods)		9, 9, 8, 10, 5	-	2
Baldpate (4 broods)	5, 7	9	-	1
Mallard (3 broods)	8	3	?	-
Gadwall (2 broods)	?	12	-	-
Green-winged teal (1 brood)	-	?	-	-
Unidentified (2 broods)	4	7	-	-

Grand Total - 62 broods.

Broods per square mile (5.5 square mile sample) - 11.3

Where only part of a brood was seen - a question mark is used under the appropriate age class.

Strathmore - Calgary Area, Alberta

This area was selected for intensive coverage as it is typical of the western more humid section of the short grass plains of southern Alberta. The land is nearly all cultivated. There is considerable irrigation.

The study area is laid out as a transect twenty-five miles long totalling 6.25 square miles. This shape is the most convenient for aircraft coverage.

Three ground transects were run through the area in May to establish the breeding population, the results of which are given below. The United States Fish and Wildlife Service flew the transect May 16 and 26 for comparison with ground data obtained on similar dates. An intensive brood count was made by ground and air on July 8. By this date many pintail broods were flying and the count has little value in establishing the success of the nesting season.

Table III - Number of Breeding Pairs*- Strathmore - Calgary Area

Species	May 1	May 16	May 27
Pintail	254	229	183 (63 broods)
Mallard	76	71	49 (7 broods)
Shoveler	27	33	43
Baldpate	20	24	24
Scaup	11	22	23
Blue-winged teal	4	37	25
Green-winged teal	5	4	3
Gadwall	3	3	2
Canvasback	1	1	-
Unidentified	-	5	2
Totals	401	429	354
Pairs per square mile	64.1	68.6	56.6

* Number of breeding pairs is sum of observed pairs and territorial drakes.

Table IV - July 8 Brood Count - Strathmore-Calgary Area

Species	Brood Average	Brood Classes			Total
		I	II	III	
Pintail	6.6	4	10	12	26
Mallard	7.9	1	3	7	11
Baldpate	7.8	-	4	-	4
Blue-winged teal	9.0	2	3	-	5
Gadwall	12.3	-	4	-	4
Shoveler	11.3	1	1	1	3
Canvasback	7.0	-	1	2	3
Totals		8	26	22	56

Total number of broods - 56 (8.9 per square mile)
Over-all average brood size - 7.82

On July 8, pintails in the late Class III stage were definitely very scarce in comparison to previous observations throughout this area. On one pothole alone where 17 broods had been previously counted, only 6 could be located. The majority of these early pintail and mallard broods were on the wing and had moved on, either to larger areas or to the north.

Observation was extremely difficult in many of the areas due to the rank emergent vegetation. As a result of this growth, a great deal of accuracy was forfeited.

The Caron Pothole Area, Saskatchewan

The study area, four and a quarter square miles in extent, is located in the Missouri Couteau approximately fifteen miles southwest of Moose Jaw, Saskatchewan. Here the Couteau is rugged and typical knob and kettle topography results. Numerous water areas (261), and uncultivated conditions make this area very attractive to nesting waterfowl.

Ducks Unlimited have made annual breeding population and brood counts in the area since 1947 - excepting 1949. Results of these counts for the last three years are given in Table V.

The 1952 breeding population and brood production were the greatest of which we have record. The most conspicuous gain was recorded for the mallards, which tripled their population of the previous two years. Blue-winged teals and pintails also showed substantial increases. Since 1950 the number of diving ducks has increased, although still comprising a very small part of the total population. This probably reflects the improvement in emergent cover, particularly round-stem bulrush, which has taken place during the past two years of relatively high water.

Table V - Breeding Population and Production, Caron Pothole Area - 1950-1952

	BREEDING POP. in pairs			BROOD COUNTS JUNE			AUGUST			Total Broods		
	1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952
Blue-winged teal	75	90	143	-	13	21	12	26	53	12	39	74
Shoveler	42	52	34	1	6	3	10	13	10	11	19	13
Pintail	35	57	79	1	22	23	4	6	12	5	28	35
Mallard	31	34	111	3	8	29	10	2	29	13	10	58
Baldpate	28	24	26	-	3	8	13	9	9	13	12	17
Gadwall	18	33	40	-	-	1	8	11	11	8	11	12
Lesser scaup	7	8	9	-	1	-	3	6	14	3	7	14
Redhead	2	10	23	-	-	1	2	2	4	2	2	5
Green-winged teal	1	5	14	-	1	3	1	1	4	1	2	7
Ruddy duck	1	4	6	-	-	-	1	4	-	1	4	-
Canvasback	-	4	5	-	-	-	-	1	3	-	1	3
Unidentified	-	-	-	-	-	10	21	15*	21	21	15	31
Total	240	321	490	5	54	99	85	96	170	90	150	269
No. per sq. mile	56.3	75.5	115.3	1.1	12.7	23.3	20.0	22.6	40.0	21.1	35.3	63.3

* Females had abandoned some broods while still flightless. These were rafted on the larger sloughs. It was impossible to count them in broods, so the total was taken, divided by 6 (average brood), and expressed as broods.

Southey Study Area - Saskatchewan

Description - The study area, 2 square miles in extent, is located 41 miles north of Regina, Saskatchewan, specifically sections 32 and 33-23-18 W2. It lies in the transition between the Dark Brown and the Black soil zones. Numerous "bluffs" or groves of willow and aspen are characteristic of this transition. The topography is rolling with numerous sloughs and potholes most of which are willow and aspen ringed. All suitable land is cultivated, the only land not under cultivation is farmyards and sloughs and a few stony areas which are in pasture.

Pond Conditions During Breeding Season - All 125 ponds within the area were full when first inspected April 24. Spring runoff was very light but there was a good carry-over of water from the previous fall. There was very little rain in the month of May and temperatures were high, resulting in 41 ponds drying up by May 22, and 34 others with less than 6 inches of water. Evaporation was high during the months of June and July resulting in 25 ponds remaining by June 24 and 6 by August 7. Only 3 of the remaining 6 usually last through the summer; of the other 3, 2 are sloughs in which dugouts are located, the sloughs were dry but the dugouts were full, the other is a dugout located in a small dry ravine and at no time supported ducks. Of the 5 broods counted in August, 4 were found on the 2 dugouts located in the sloughs.

There was little emergent cover suitable for nesting cover for the over-water nesting species. Only one pond contained cattail and a small amount of roundstem bulrush, this pond was dry by August. All ponds had very heavy grass cover.

Waterfowl Population - During the latter part of April and May the breeding population was determined by weekly inspections of all ponds in the area and territorial pairs noted.

Production was determined by two brood counts, the first on June 24 and the second on August 7. These counts were summed for total production. The number of broods for the count in June was determined mainly by counting the feigning females. Water levels had receded considerably and grass cover was very heavy, some ponds being entirely overgrown, thus making it impossible to accurately count the broods. Conditions were different for the August count. Only six water bodies remained and each was of sufficient depth to contain some open water. The marshy areas were tramped out and the broods driven to open water where an accurate count was possible. It is reasonably certain that all broods in the area on the above dates were counted.

Few ducks other than breeding pairs and broods were found on the area. On June 24 a flock of seven mallard drakes was seen and on August 7 a flock of five mallards, the latter were juvenile.

There was nothing to indicate that brood movement within or in and out of the area had or had not occurred. The ponds supporting broods all had territorial pairs of the species concerned during the spring.

No information was obtained on nesting or brood losses. No destroyed nests were found and no signs of predation on broods were noted. It is expected little renesting occurred on the area as most of the ponds were dry by the end of June. There is a very good 40-acre marsh within 1 mile of the study area which may have attracted many of the renesters, which may account for the low success of the blue-winged teal.

Crows were very numerous in the area, 5 pairs nested in the 2-square miles. Other predators in the area were the magpie, owl, hawk, skunk and weasel.

Table VI - Breeding Population and Production - Southey Study Area

Species	Breeding Population May 22	Brood Counts June 24	August 7	Total
Mallard	13	3	2	5
Pintail	6	2	-	2
Gadwall	1	-	1	1
Baldpate	3	1	1	2
Shoveler	2	1	-	1
Blue-winged teal	7	-	1	1
Green-winged teal	2	2	-	2
Lesser scaup	2	-	-	-
Canvasback	1	-	-	-
Redhead	1	-	-	-
Total	38	9	5	14
Pairs per square mile	19	4.5	2.5	7.0

Table VII - Summary of Data on Water Conditions - Southey Study Area

Date	Ponds with Water
April 24	125
May 22	84
June 24	25
August 7	6

WATERFOWL BREEDING GROUND SURVEYS OF SPECIAL STUDY AREAS IN ALBERTA

Allen G. Smith

Introduction

With the termination of the ground transects in 1952 on the Alberta waterfowl breeding grounds, personnel became available for the first time for a more intensive study of specific areas of the Province. Four major ecological types were selected as the locales for these studies.

The purpose behind these investigations were two-fold; first, through a continuous residence on the areas in question repeated observations would make it possible to keep accurate records on weather, changing water conditions, breeding populations, nesting and hatching success and brood survival. Secondly, by setting up the ground study areas as linear units which could be easily surveyed by plane, it was possible to make checks of breeding populations and broods by both aerial and ground crews. This gave us data which we hope will eventually aid us (after sufficient samples have been studied) in establishing a measure of error as it exists in aerial observation in different representative ecological zones.

Five intensive study areas were under observation, two on the prairies by personnel of Ducks Unlimited (Canada), and three in the parklands by representatives of the Canadian Wildlife Service, Alberta Game Branch and the U. S. Fish and Wildlife Service. Data relative to the Ducks Unlimited Study Areas (Numbers 4 and 5) is included in a separate report by Mr. William Leitch.

General Description of the Study Areas

Areas 1 and 2

These two areas, separated by the town of Vermilion, extend in a north-south direction from Wainwright to the North Saskatchewan River a few miles south of Elk Point. Messrs. Donald Reid of the Canadian Wildlife Service and John Stelfox of the Alberta Game Branch were the investigators in this study. Area 1 of 9.2 square miles and Area 2 of 9 square miles are located in eastcentral Alberta. The terrain in this district varies from rolling to hilly and it lies close to the northern limits of the parklands of central Alberta. In fact, the North Saskatchewan River is considered to be the northern limits of the parklands at this point. The aspen groves are larger and more dense and yet the land as a whole is more heavily devoted to wheat raising than is true in Area 3, the other parkland study area. Potholes and ponds are numerous and though many are of a temporary nature, approximately 1/2 of those present in spring would hold water, except in cases of severe drought. Annual rainfall averages from 17 to 19 inches. In 1950, a drought year, 14.4 inches of precipitation was recorded; in 1951, a wet year, 18.1 inches occurred.

Area 3

This area is located between Lousana and Elnora about 3 miles inside the southern limits of the parklands of westcentral Alberta. This intensive study was made by Wayne H. Heuer, U. S. Fish and Wildlife Service. Area 3 may be classified

as a somewhat open parkland type in which potholes are heavily ringed by aspen and willow, but the area surrounding the potholes is composed primarily of prairie. The district is devoted to both wheat farming and cattle ranching, with the study area itself located almost exclusively on land used as pasture. Potholes and lakes are frequent and generally of a depth sufficient to hold water except in severe drought. Annual rainfall averages about 17 inches, with 12.6 inches falling during dry 1950; 18.9 inches during a wet year, 1951. Throughout the period of the study, the district had excessive rainfall which resulted in a greater than normal precipitation during the growing season for a second year in succession. Field work was seriously hampered by ten days of rain between May 15 and May 31 (2-1/2 inches) and 17 days of rain in June (9 inches).

Soil Characters and Vegetative Aspects of the Study Area

Areas 1 and 2

Area 1 is located in the shallow black soils and Area 2 in the black soils of the eastern portion of the Province. Vegetation was similar to Area 3, which is described in the next paragraph. Agricultural activity is more concentrated on wheat raising so that aside from the aspen groves and their edging of buckbrush and willow, much of the natural ground cover has been destroyed by plowing. Where the natural vegetation has not been seriously disturbed except by grazing, the shrubby forms are in more dense stands than occur in Area 3. Larger and deeper lakes appear in this district than in any of the other study areas and severe drought is of less frequent occurrence than in the south.

Area 3

Area 3 is located in the black soils of central Alberta. The southern portion of this study area is only two miles inside the southern boundary of the parklands in the Kneehills. The district is subjected to winds throughout much of the year but evaporation is lower than on the nearby prairies because of the effect of the dense aspen and willow edgings which shade so many of the potholes.

The emergent vegetation in the potholes of this study area is composed almost entirely of whitetop (Fluminea festucacea), sedges (Carex spp.), hardstem bulrush (Scirpus acutus), and cattails (Typha spp.). In normal and wet years, a heavy cover of prairie grasses carpet the ground. These are interspersed with dense stands of buckbrush (Symphoricarpos occidentalis), rose (Rosa spp.), wolf willow (Elaeagnus argentea), and saskatoon (Amelanchier alnifolia), all of which provide an abundance of nesting cover. Aspen (Populus tremuloides) and willow (Salix spp.) occur in groves surrounding the ponds and moist locations throughout the area.

Methods

Identical methods of making breeding population and brood counts were followed in all study areas. In each case, ground counts were made at a time which would coincide as closely as possible with the aerial coverage of the same area.

On Areas 1, 2 and 3, it was possible to make a more careful study over and above the comparison of ground and aerial methods and results. In these cases, the men involved spent the entire summer on these studies and records were kept of the shifting populations during the breeding season as well as the brooding season. Nesting studies were made and brood counts were kept throughout the summer. The effects of agricultural activities, the rising and falling water levels, predation, and weather on the production of waterfowl were also noted. Studies of this type have not been possible in Alberta in the past, therefore we have no comparative data. It has been of considerable value in interpreting events in the parklands where aerial observations were weakest.

On Areas 4 and 5, where observations were made by personnel of Ducks Unlimited (Canada), it was not possible for the investigators to spend all of their time on the study areas because of their other duties elsewhere in the Province. Therefore, their cooperative efforts were directed toward a study of the comparison of ground and aerial surveys of prairie waterfowl habitats.

Weather and Water Conditions

Weather conditions were ideal during the past spring for a successful waterfowl breeding season. Above normal precipitation in 1951 had soaked the entire south and central portions of the Province. Water was plentiful on both the prairies and parklands, and water levels were high. April and May of 1952 were dry and warm. An early arrival of waterfowl following an early spring break-up caused nesting to begin throughout southern and central Alberta by mid-April. No rains fell until mid-May, and these came primarily to northern and central areas. By early June, the southern prairies received sufficient rainfall to end the threat of drought there and further precipitation in July caused a good hold-over of available brooding areas. The parklands suffered temporary precipitation deficiencies in May and early June but received very generous amounts by mid-June. Area 3 had the dubious honor of being located in the wettest portion of the Province this summer. Water levels there were higher by the end of June than they had been on May 1. As the summer was relatively cool, evaporation hardly kept pace with precipitation in many parkland areas.

Water level readings were kept on Areas 1, 2 and 3 in order to measure the effects of evaporation and precipitation on the condition of A, B and C type areas. Rainfall was below normal on Areas 1 and 2 during May and early June. (5.98 inches of rain fell between May 1 and July 15.) Rapid evaporation and lowering water levels caused the disappearance of all C areas and many B areas. Nevertheless soil moisture content was high and the dry period had very little effect on the permanent areas, caused no hardships to broods and apparently did not affect production.

Rainfall was above normal on Area 3 (13.16 inches from May 1 to July 17), a fact reflected in the condition of potholes by mid-summer. A permanent 100 acre shallow alkaline lake with a minimum of emergent and submergent vegetation, registered a loss of only 1-1/4 inches of water during the period of this study. A and B areas of sizes from 5 acres to 1/8 acre registered gains in water levels as great as 2-3/4 inches, and losses up to 9-5/8 inches. In small potholes, water conditions were dependent upon the degree of shading by surrounding vegetation and the density of emergent vegetation.

Table I - Total Water Bodies on Areas 1, 2 and 3 to height of Nesting Season*

Date	Area 1	Area 2	Area 3
May 6	121	148	84
May 13	125	140	82
May 18	116	126	80
May 27	80	105	76
June 4	72	89	72
Percent decrease	40.5	39.8	14.3

*Provincial loss of water May 1-July 1 - 26.75 percent
Parkland loss of water May 1-July 1 - 30.15 percent

Table II - Pothole Classification - Areas 1, 2 and 3 -- May 6-June 15

	Area I		Area 2		Area 3	
Type	May 6	June 15	May 6	June 15	May 6	June 15
A-permanent	54	33	30	35	60	53
B-semi-permanent	39	17	65	33	13	17
C-temporary	28	22	53	21	11	2
Total	121	72	148	89	84	72

Areas 1 and 2 suffered water losses exceeding the Provincial (26.75 percent) or parkland (30.15 percent) average for the same period. Area 3 reflects the abundance of rainfall in that area by a loss of only 12 areas or 14 percent during the nesting period.

In former years the size of the area in Alberta where waterfowl populations have been under study (64,300 square miles) was far too large to allow for repeated observations of changes in the population throughout the season. By the establishment of small study areas and the assignment of full time observers to these areas, records were kept this year at weekly intervals from May through July. It is difficult to know with certainty that aerial sampling of breeding populations is made at the ideal time when the greatest number of species are settled down to the task of nesting. By making weekly checks at specific locations, we can learn both the phenological condition of the waterfowl populations in those areas and how well the date selected for aerial coverage has coincided with the maximum populations present. The most pronounced shift occurred in mallard populations. Early changes may result from late arrivals but those occurring after May 15 could be accounted for by the loss of early nests to agricultural activity. This is particularly true in the district around Areas 1 and 2 where farmers were able to plow their stubble earlier than in much of the Province because of the prolonged dry period from April through mid-June.

From 1947 to 1951 the breeding season in the northern parklands has been about two weeks later than that on the southern prairies. This year, with the entire area opening up at once, nesting began at the same time throughout all of southern and central Alberta.

Because aerial flights are limited by time and weather conditions, it is not always possible to make observations at a period corresponding with the greatest build-up of waterfowl populations throughout all of Alberta. The breeding population figures for the Province are now based on aerial observations. Therefore, it is of interest to know the condition of the observed population on the flight dates. The breeding population count was made on Areas 1 and 2 on May 22, on Area 3 on May 18. We now find that in study Area 1 we were one week late in sampling the peak population. On Area 2 the difference between the population density on the date of the aerial flight and one week following was very small and for practical purposes it could be said that we sampled the peak population at the correct time. Aerial sampling on Area 3 was one week early though the peak on the following week was not very much greater.

Nesting Studies

Each of the observers spent a considerable amount of time searching for waterfowl nests throughout the period of the study. These searches are always rewarded to a greater degree on the prairies where cover is less dense. Two wet years in succession provided a maximum cover density in the parklands this year which lessened the success of the searches. Then, too, nests are more easily located in known nesting marshes of considerable size. On the study plots, waterfowl habitats are composed of scores of very small water bodies with continuous large acreages of densely vegetated ground surrounding them and extending for miles in all directions. A condition like this intensifies the problem of finding the fewer nests which are scattered over vast acreages.

On the basis of the information obtained by these nesting studies, 69 percent of the waterfowl nests located within 1/8 of a mile of a highway hatched successfully on Areas 1 and 2. Only 50 percent of the nests located at distances greater than 1/8 of a mile from a highway were successful in the same districts. In Area 3, 42 percent of the nests close to highways were successful while only 33 percent of those located over 1/8-mile from a highway were brought off successfully. These results are at variance with a preconceived idea that highways tended to lessen the hatching success. The information available here is still of minor importance when total breeding areas are considered but it would seem at least possible that "highway interference" if any, works to the advantage of the ducks in keeping predators at a safe distance, for predator loss mounted as the distance from a highway approached 1/4 mile or more.

Particular care was taken by observers making nest studies to create the minimum of disturbance at a nest site. However, it is felt that the human element is a very important factor in causing nest losses, especially in the case of upland waterfowl nesters. No amount of precautions at the nest or in searching for it can eliminate the human spoor from an area which has been criss-crossed by men searching for nests. Coyotes, skunks, and dogs will all follow a man's trail. Crows and magpies will actually watch a man's actions in the field. After an observer has left the site of a nest where he obviously will spend a few moments making proper recordings, both crows and magpies will fly to that nest site to investigate. A constant repetition of predation on nests in Area 3 and the surrounding district immediately after the first discovery of a nest, leads one to question the accuracy of our findings based on the unnatural bias of human interference.

Table 3 -- Nest History Data for Parklands - Areas 1, 2 and 3

Species	Total Nests	Total Eggs	Average Clutch Size	Unsuccessful Nests	No. Successful Eggs	Percent Success	EGG LOSS CAUSED BY						
							Desertion	Infertile Eggs	Plowing	Crows	Coyote	Fire	Unknown Predator
Mallard	39	315	8.0	10	219	74	13	-	28	17	10	-	28
Pintail	7	42	6.0	4	21	43	-	1	13	-	-	-	7
Gadwall	3	25	8.3	2	16	33	-	-	-	-	-	-	16
G-w. teal	2	18	9.0	1	9	50	9	-	-	-	-	-	-
B-w. teal	6	51	8.5	4	19	67	-	-	-	24	-	-	8
Shoveler	2	18	9.0	1	9	50	-	-	-	-	-	-	9
Redhead	1	11	11.0	0	11	100	-	-	-	-	-	-	-
Canvasback *	13	113	8.6	11	7	0	53	11	-	4	-	-	11
Scaup *	9	78	8.6	0	67	100	1	-	-	-	-	-	-
Ruddy *	4	31	7.7	3	0	0	1	-	-	-	-	22	-
Total	86	702	8.2	36	378	58	77	12	41	45	10	22	79
Coot	88	956	10.8	1	923	99(?)	-	15	-	-	-	-	-

* One nest history incomplete.

The recorded success of the coot nests under observation is considered to be highly questionable data and for that reason the success figures are suffixed with a question mark. The true success of coot nests is difficult to ascertain because of many factors, structure of the coot nest, the lack of any egg-shell remnants at the nest and a few characteristics of the species which make nesting study methods used for other waterfowl unsuccessful when applied to coots.

Ground versus Aerial Observations of Waterfowl Populations on Areas 1, 2, 3, 4, 5

In order to census the various intensive study areas most efficiently from the air, they were laid out in a linear form. In May and again in July aerial flights were made over all five areas at a time which corresponded, within the space of a few hours, to the period when the ground counts were made. After the population and production surveys were completed and comparisons of the information so gathered were made, we found ourselves still doubtful as to the possibility of interpreting the results.

After the data from intensive ground-air studies in the other Provinces are analyzed and improved sampling techniques are established for future investigations on this subject, we should be in a better position to establish the degree of error introduced by an aerial approach to population and production surveys. At the moment, with the data at hand from Alberta, this is not practical.

Table 4 - Comparison of Ground and Aerial Observations of Waterfowl Breeding Populations on Areas 1, 2, 3, 4 and 5

			DUCKS PER SQUARE MILE			
			Population		Indicated Populations	
Area	Vegetation Type	Strata	Ground	Aerial	Ground*	Aerial*
1	Mixed Parklands	B	15.0	10.5	21.0	15.7
2	Mixed Parklands	B	37.7	16.5	54.8	25.4
3	Parklands	B	55.7	32.3	78.4	41.1
4	Mixed Prairie	A	87.0	43.7	137.2	77.1
5	Short-grass Prairie	A	64.7	39.0	87.6	61.4
	Average		48.4	26.3	70.2	41.8

* Indicated population obtained by considering one female as present for each lone male observed in the breeding population.

Table 5 -- Comparison of Brood Production by Aerial and Ground Surveys

Area	Total Broods Seen		Broods Per Square Mile	
	Ground	Aerial **	Ground	Aerial
1	34	12	3.7	1.3
2	21	16	2.3	1.7
3	16	12	6.1	4.6
4	56	68	8.9	10.8
5	43 *	32	5.0	3.7
Total	170	140	4.8	3.9

** Aerial count made on 1/8-mile strip - figures doubled to make them comparable to ground strip of 1.4-mile.

* Broods plus feigning females.

Based only on the five study areas listed above, it would appear that on the prairies aerial and ground observation of broods was almost identical, while aerial observation recorded 62 percent of the breeding waterfowl present. In the parklands, the aerial crew found about 56 percent of the broods and 53 percent of the breeding waterfowl located by the ground crew who utilized the "beat-out" method.

Weekly censuses of breeding populations as well as weekly brood counts show wide variations in monthly, weekly and even daily waterfowl populations on individual habitats. This wide range of area utilization of a habitat by breeding birds throughout the summer months and of broods during June, July and August makes it extremely difficult to establish definitely the resident population of districts as small as these study areas. The movement of broods into and out of a particular pothole is a constant occurrence. This localized overland migration occurs particularly at the period when the brood reaches a Class II size. Nevertheless, broods hatched on or near one pothole may move overland within the period of one week, to another pothole or lake one quarter or more miles away. This is true not only among the puddling ducks but also among such divers as redheads, canvasbacks and scaups. Observations over a six year period on the Alberta waterfowl breeding grounds lead one to believe that isolated lakes and ponds are about the only habitats where brood histories can be kept with any hope of real accuracy. Districts where potholes are present in large numbers and in close proximity to each other are the scene of widespread and repeated local migrations of females and their broods. This migration is of such proportions and duration as to preclude the possibility of following the history of a population known to nest on or around a study area whose dimensions are linear in nature.

Summary

1. Three intensive ground study areas in the parklands were selected for observation during the Alberta waterfowl breeding season of 1952. These areas were under continuous study during May, June and July. Data was recorded on such subjects as: weekly changes in breeding waterfowl populations, ecological aspects of the waterfowl habitats, water levels of potholes, land use of the study area, nests and nest histories, hatching success and brood survival, as well as weekly records of brood utilization of the study areas.

2. Two ground study areas on the prairies were surveyed intensively twice during the summer, once for a breeding population estimate, and a second time for brood information.

3. On all five study areas, ground population and brood counts were made at a time to correspond with aerial coverage of the same sections. This was done with the idea of attempting to arrive at a measure of the degree of error present in aerial survey methods.

4. Generally speaking, water levels were above normal throughout the breeding season, with many areas registering more water in July than in May.

5. Water body loss on the three parkland study areas varied from a high of 40.5 percent (Provincial average 26.7 percent) to a low of 14.3 percent.

6. Waterfowl breeding populations showed considerable variations in density throughout the season in all study areas.

7. Nest histories were kept on 86 duck and 88 coot nests. Duck nest hatching success averaged 58 percent with mallard success 74 percent and pintail success 43 percent.

8. Nest losses were due primarily to predators of which the crows and coyotes were most important. The canvasback showed a great sensitiveness to human interference where 11 out of 13 nests were found deserted after the observers first visit to the nest. It would seem that in the studies described above that the human factor in nesting studies was the indirect basis for a majority of all nest losses.

9. Cover-type preference for parkland nesting waterfowl are extremely varied. Three species showed considerable one-sided preferences: mallard for buckbrush, canvasbacks and coots for hardstem bulrush.

10. At the present time, using only the sample areas from Alberta, it does not appear to be possible to measure the degree of error between aerial and ground methods of population and brood observations. When information is available from the other prairie Provinces or when more samples are studied in Alberta, it may then be possible to measure aerial error more accurately.

11. The brood average for all species on the five intensive study areas in Alberta was 6.81 young per brood in 1952.

12. Local migrations of the broods of puddlers and some of the divers makes accurate checks of a resident population very questionable in pothole areas. This is particularly true when study areas are linear in form.

WATERFOWL BREEDING SURVEY IN NEWFOUNDLAND

Leslie M. Tuck

Introduction

The objectives of this survey were to determine the status of breeding waterfowl in the island of Newfoundland by examining representative areas.

Three areas of the Southern Shore (50 miles SE of St. John's) totalling 5 square miles were considered representative of that portion of the Avalon Peninsula. One square mile, comprising a large pond and several gullies at Whitbourne, was selected as a sample of the interior of the Avalon Peninsula, and 3 square miles of the Dunn's River section (Swift Current) as a typical example of the transition zone between the Avalon Peninsula and the main body of the Island. These 3 areas were examined during the period from May 14 to May 22.

The main body of the Island was sampled by air from May 31 to June 1. Aerial transects were run across Dunn's River, which had previously been examined from the ground, across the interior of the Island, which contained numerous bog ponds still containing ice on June 1, and across Sandy Lake and the upper reaches of the Humber River which are typical portions of the West Coast.

Methods

On the larger ponds and on Dunn's River a canoe was used to good advantage. All other areas in the ground survey were covered by foot. Binoculars were used throughout the field work.

A Beaver aircraft was used for the aerial work which was conducted at a height averaging 80 feet with a ground speed of 90 mph. Although geese could be picked up clearly at a much greater altitude, the varying habitats require low altitude and slow flying for specific identification. It is believed that some of the diving ducks, the goldeneye in particular, sometimes dived at the critical moment and thus escaped being counted from the aircraft. A tape recorder was used to very good advantage during this phase of the survey.

Weather and Water Conditions

Phenologically, the spring of 1952 was similar in most respects to that of 1950, but a thick blanket of snow which fell late on the higher portions of the centre of the Island had not completely disappeared by June 1. The area so affected had a low population of breeding waterfowl, but it is believed that this is normal. Spring arrived on the West Coast (i.e. the Humber) 2 weeks ahead of the interior and Southern Shore areas, and on parts of the South Coast (Swift Current) it was a week ahead. This is considered a normal condition caused by oceanic winds and probably does not affect the breeding conditions of the waterfowl on the Island. A brood of black ducks was recorded on May 16 which compares favourably with other more advanced spring seasons.

Because of late snows, the ponds and lakes maintained high levels up to early summer.

Results of Survey

Nine square miles of ground survey and 30 square miles of aerial survey during May 14 to June 1 yielded 572 waterfowl excluding young.

In addition to the breeding waterfowl listed in Table II, the following species were found in the areas indicated and being in flocks were considered late migrants or non-breeders.

Table I - List of Non-Breeding Waterfowl in Areas during Survey

Species	Southern Shore	Swift Current	Humber
American goldeneye	-	21	18
Canada goose	8	11	32
Red-breasted merganser	43	-	-
Eider ducks	4,000	-	-
Old squaw	1,500	-	-

Table II - List of Breeding Waterfowl

Species	Number of Individuals	Numerical Rank
Black duck	171	1
Green-winged teal	81	3
Ring-necked duck	16	6
Goldeneye	50	4
Canada goose	170	2
Scaup	6	7
American merganser	6	6
Red-breasted merganser	72	5
Total	572	

Table III - Waterfowl Populations - Ground Survey

Species	Southern Shore (5 sq. miles)	Whitbourne (1 sq. mile)	Swift Current (3 sq. miles)
Black duck	22	5	13
Green-winged teal	4	2	5
Ring-necked duck	4	0	0
Goldeneye	4	0	0
Canada goose	3	5	24
Scaup	6	0	0
Others	32	0	3
Total	75	12	45

Table IV - Waterfowl Populations - Aerial Survey

Species	Interior (6 sq. mi.)	Humber (10 sq. mi.)	Sandy Lake (4 sq. miles)	Swift Current (10 sq. miles)
Black duck	2	86	6	37
Green-winged teal	5	36	13	16
Ring-necked duck	0	8	4	0
Goldeneye	0	23	8	15
Canada goose	7	60	19	52
Others	14	25	21	3
Total	28	238	71	123

Table V - Waterfowl Densities Per Square Mile

Area	Ground	Aerial
Southern Shore	15.0	
Whitbourne	12.0	
Swift Current	15.0	12.3
Sandy Lake		17.8
Humber		23.8
Interior		4.7

Table VI - Waterfowl Densities Per Square Mile by Species (Ground)

Species	Southern Shore	Whitbourne	Swift Current
Black duck	4.5	5.0	4.3
Green-winged teal	.8	2.0	1.7
Ring-necked duck	.8	.0	.0
Goldeneye	.8	.0	.0
Canada goose	.6	5.0	8.0
Scaup	1.2	.0	.0
Others	6.4	.0	1.0

Table VII - Waterfowl Densities Per Square Mile by Species (Aerial)

Species	Interior	Humber	Sandy Lake	Swift Current
Black duck	.3	8.6	1.5	3.7
Green-winged teal	.8	3.6	3.3	1.6
Ring-necked duck	.0	.8	1.0	.0
Goldeneye	.0	2.3	2.0	1.5
Canada goose	1.1	6.0	4.8	5.2
Others	2.3	2.5	5.2	.3

Summary

In the Island of Newfoundland a total of 39 square miles of waterfowl habitat was examined by the author during the latter part of May.

Seven separate localities were surveyed and a total of 572 individual waterfowl was recorded. The black duck was found to be the most abundant breeding waterfowl and this species was followed closely by the Canada goose. Green-winged teal and goldeneye were next in abundance. Ring-necked duck, scaup and mergansers completed the recorded breeding waterfowl.

WATERFOWL BREEDING GROUND SURVEY IN THE ST. JOHN ESTUARY

Brian C. Carter

Introduction

This is the 8th consecutive year that the survey has been carried out in the St. John Estuary and as the method has not changed, all results are comparable.

Phenology

Canada geese were the first of the waterfowl to arrive on the study area this year. They appeared on March 13 and were 17 days earlier than their average arrival date of March 30. Next to arrive were the black ducks on March 17 as compared with their average arrival date of March 27. The black ducks were closely followed by the goldeneyes on March 19 (average March 26), wood ducks on April 6 (average April 8), ring-necked ducks on April 13 (average April 19), brant on April 20 (average April 11), blue-winged teal on April 29 (average April 19), pintails on May 3 (average April 23), green-winged teal also on May 3 (average April 21), mallards on May 3 (average April 16), and scaup on May 5 (average April 16).

The ice broke up in the St. John River on April 13 which was 9 days later than last year but was 4 days earlier than the 126-year average of April 17.

The annual freshet was slow in attaining its full height, but due to a very wet spring and early summer the water level was consistently higher than normal during the breeding season. The continuous high water held back the development of many of the aquatic plants in the area--many of the species (notably wild rice) had not seeded by the middle of August. There was little water fluctuation to disturb the ground-nesting species of ducks.

Hatching Success and Brood Survival

Table I shows the hatching success and brood survival for 1952 and compares this year with the average for the years 1945 to 1952 inclusive.

A larger number of broods were observed than in the past two years in spite of the difficulty of locating Class I broods which stayed in the primary rearing covers longer than usual due to the higher water level. This year most classes of broods were larger than usual and the decrease in brood size from Class I to Class II was small in most cases. When the water level started to drop in late June and the broods were forced into more open water the reduction in brood size was more evident. In general all brood sizes were larger than the average this year. Higher water levels appear to mean more and better cover with better protection for the broods during their early life, and consequently larger Class I and Class II broods result.

Table I - Hatching Success and Brood Survival

Species	Class I No. Broods	Class I Dkls./ Brood	Class II No. Broods	Class II Dkls./ Brood	Class III No. Broods	Class III Dkls./ Brood	Remarks
Blacks							
Av. (45-52)	17.2	7.7	11.4	6.2	15.8	6.6	
1952	8	8.0	12	7.7	17	7.6	
B-w. teal							
Av. (45-52)	1.6	6.2	2.9	6.2	4.6#	7.1#	# 7 years only
1952	4	6.0	3	7.7	5	8.2	
G-w. teal							# 6 years only
Av. (45-52)	2.3#	7.4#	2.6°	6.6°	4.2@	5.9@	° 7 years only
1952	-	-	3	8.7	4	5.8	@ 5 years only
Wood duck							
Av. (45-52)	6.7#	6.3#	9.9	5.9	8.1	5.6	# 7 years only
1952	3	8.7	12	6.5	6	5.8	
Ring-necked duck							
Av. (45-52)	19.4	6.9	15.6	6.5	7.2#	5.6#	# 6 years only
1952	11	8.2	16	6.4	1	4.0	
Goldeneye							
Av. (45-52)	22.7#	6.1#	9.9	4.8	8.9	4.5	# 7 years only
1952	18	6.7	15	5.8	12	4.2	

Breeding Population

Species Composition

The black duck is still the most abundant breeding species on the study area and has increased greatly over last year. The population is at present the largest since this breeding ground survey was started in 1945. All the remaining breeding species except the two species of teal show an increase over last year.

Table II - Species Composition of the Breeding Population

Species	Total Population 1952	Percent
Black ducks	1,405	60.7
Blue-winged teal	160	6.9
Wood duck	333	14.3
Ring-necked duck	210	9.1
Green-winged teal	78	3.4
American goldeneye	127	5.5
Mallard	3	0.1
Total	2,316	100.0

The wood duck, the ring-necked duck and the American goldeneye have all increased in importance from last year; but the two species of teal have decreased, especially the blue-winged teal.

Population Trends from 1945

The population trends on the study area are measured by using the breeding population of the first year of the study (1945) as a base, and measuring the percentage of increase or decrease of each species during the following years.

The waterfowl population as a whole has increased greatly and is 22.5 percent greater than last year. Black ducks are present in greater numbers than ever before in this study. This year they are 128 percent more abundant than they were in 1945. Wood ducks and goldeneyes are also more abundant than they were in 1945, being 7 percent and 140 percent greater in numbers respectively. Green-winged teal, blue-winged teal and ring-necked ducks are all less abundant than they were in 1945 although ring-necked ducks are more common than they were last year.

Table III - Population Trends from 1945 (percent)

Species	1946	1947	1948	1949	1950	1951	1952
Black ducks	- 49	- 9	- 24	+ 84	+111	+ 58	+128
Wood duck	- 80	- 68	+ 16	+ 82	+ 23	- 25	+ 7
Blue-winged teal	- 88	- 87	- 70	- 31	- 44	- 39	- 58
Ring-necked duck	+ 3	- 49	- 18	+ 11	+ 11	- 21	- 11
Green-winged teal	- 14	- 78	- 74	+ 33	+ 23	+ 29	- 37
Goldeneye	- 63	+189	+ 85	- 41	- 5	+ 81	+140
Average	- 54	- 42	- 26	+ 43	+ 37	+ 8	+ 34

Table IV shows the duck population per square mile of open marsh on the study area and for the first time since 1949 shows an increase although it still has not reached the high of that year.

Table IV - Duck Population per Square Mile of Open Marsh

Year	Ducks Per Square Mile
1945	111.9
1946	53.5
1947	69.4
1948	84.1
1949	165.2
1950	157.6
1951	125.1
1952	153.3

Conclusion

The 1952 season has been a successful breeding season, and while the population has not yet reached the high of 1949, all species show an increase over last year with the exception of the two species of teal. The black duck population is the highest that has been recorded since this survey began in 1945. The American goldeneyes appear to be recovering from their low of 1950 and this is their second year of increase. The green-winged and blue-winged teal have decreased again after their slight upward swing of last year. There is a slight increase in wood duck and ring-necked ducks over last year.

The breeding season was very successful with blacks, blue-winged teal, and wood duck showing a decrease in brood mortality with a consequent increase in brood size.

WATERFOWL BREEDING GROUND SURVEY IN WASHINGTON

Raleigh Moreland

Personnel taking part in the field work and preparing reports which are included in this survey are: Henry A. Hansen, Wendell H. Oliver, Robert G. Jeffrey and Donald S. Galbreath, Federal Aid Project Personnel.

Introduction

The 1952 waterfowl breeding ground survey represents the fifth consecutive year such a survey has been carried on in Washington. The State for the purpose of study has been roughly divided into 3 segments - western, central and eastern Washington, with waterfowl biologists being permanently assigned to each segment. All primary breeding grounds in each segment are included in the study. In eastern Washington breeding grounds consist of potholes and lakes which produce approximately 85 percent of the waterfowl in the State. Central Washington has 2 types of waterfowl breeding ground habitat varying from natural ponds and lakes in the northern section to irrigation canals, drainage ditches, streams, rivers and flooded areas in the southern portion. The remaining waterfowl breeding grounds are thinly distributed throughout western Washington.

Method of Sampling

During 1952, as before, breeding surveys consisted of measured ground transects through pothole and lake areas. A total count of water areas obtained from aerial photos and aerial counts provides a basis for computing the total population index for the State. A slightly different method of evaluation was applied to the irrigated lands of southcentral Washington. With the variety of habitat to census in an irrigation system it was necessary to survey entirely, representative blocks of this land. Generally, section lines within these areas of intense cultivation are well defined and outline ideal working units of a mile square. Every ninth section was considered a sample section and complete assessment of breeding waterfowl within these sections was attempted. As may be expected, many of the designated sections were eliminated from breeding importance after a cursory examination of topography and land and water use. Other sections took considerable time to thoroughly assess. Breeding habitat outside the influence of irrigation in this region is mostly river and stream habitat with some small pothole clusters in isolated areas. To evaluate breeding in these, measured linear samples and transects were conducted in the manner of former investigations. The survey of waterfowl production in western Washington is divided into two parts: counts of pairs and single males on selected plots in northwestern Washington during the territorial season, and a brood trend census made in late June and early July on sample areas scattered throughout western Washington. The brood trend census is the basis for adjusting the estimate of total waterfowl production.

Weather and Water Conditions

Throughout most of the major waterfowl production areas of eastern Washington, surface water conditions were favorable following the spring runoff which was slow and gradual. The spring and summer were excessively dry with normal temperatures. The consequent loss of some temporary ponds may have

resulted in the loss of a few late nesters. In the irrigated sections water was admitted to canals earlier in 1952 and this factor accounted for a more successful brood production on irrigated lands. In western Washington the spring and summer was fairly normal with respect to both temperature and precipitation. The spring runoff was gradual and nest destruction due to flooding was at a minimum.

Breeding Population Trends by Regions

Eastern Washington

Of the 10 major species of ducks breeding in eastern Washington, mallards, pintails, baldpates, gadwalls, scaup and ruddy ducks increased considerably in abundance. Blue-winged, cinnamon, and green-winged teal, shovelers and redheads decreased proportionately. Canada geese increased and coots lost a little from the rapid gains of the past few years. The over-all losses of some species almost offset the gains made by others so that the final total production for all species was computed to be about 5 percent above the production in 1951. In addition to the 10 species of ducks listed above, Barrow's goldeneye, canvasback, wood ducks, ring-necked ducks, and mergansers breed in very limited numbers. Collectively, they constitute about 1 percent of the total waterfowl produced in the area. Pintails made the most notable gain, about 45 percent above their 1951 population. Gadwalls increased 20 percent, mallards 15 percent, baldpate and scaup 10 percent each, and ruddy ducks made a slight gain.

The greatest loss, about 50 percent, was sustained by green-winged teal. Shovelers followed with a 35 percent loss, and the blue-winged and cinnamon teal group was down 30 percent. Based upon a ratio of male teal in breeding plumage, the loss was almost entirely among blue-winged teal. Redheads continued their downward trend of the past 4 years, dropping about 5 percent below their 1951 population.

In some species the average brood size for Class III broods was lower than in 1951, but only the pintail averaged less than 5 young per brood. Blue-winged and cinnamon teal averaged over 7 young per brood. Mallard, baldpate, gadwall, redhead and goldeneye averaged more than 6 per Class III brood. A total of 270 Class III broods averaged 5.96 young per brood. Table I lists the brood size by age class. On the transects intensively surveyed for broods in July the waterfowl usage has been computed. The Okanogan County transect of 38 linear miles averaged 20.4 broods per square mile exclusive of coots. A series of transects in Douglas and Grant Counties totalling 102 miles averaged 15.8 broods per square mile. Production on most of the other transects appeared to be comparable to the areas in Douglas and Grant Counties. The timbered regions of Spokane and the other northeastern Counties do not have as high a density of waterfowl per square mile, but the entire area is of much greater size so that the final total production is considerable in comparison.

Table I - Average Brood Size by Age Classification in Eastern Washington

Species	Class I No. Broods	Class I Average Size	Class II No. Broods	Class II Average Size	Class III No. Broods	Class III Average Size
Mallard	79	7.55	49	6.65	88	6.09
Baldpate	17	6.23	26	6.26	49	6.51
B-w. teal	23	7.39	22	7.13	19	7.26
Gadwall	28	7.07	30	7.43	13	6.69
G-w. teal	22	7.59	3	4.66	19	5.31
Shoveler	9	8.66	7	5.85	21	5.57
Pintail	20	4.45	22	6.09	30	4.86
Redhead	21	6.19	11	6.45	3	6.00
Ruddy duck	12	4.58	14	6.64	4	5.25
Scaup	12	6.75	10	7.50	0	-
Unidentified	16	6.87	13	6.69	19	5.31
Total	259	6.87	207	6.78	270	5.96

Central Washington

Although the breeding population was slightly less in 1952, more broods appeared in all areas of central Washington. Favorable nesting and water conditions were apparently responsible for the increased brood success. The total fall population was determined to have increased by 14.5 percent in 1952, fixing the total population index at 66,910 ducks and coot.

With the development of the Columbia Basin in Washington, the importance of waterfowl production within irrigation projects becomes more pronounced. Existing irrigation lands, almost all of which are located in the Yakima River Basin of central Washington, have been of relatively moderate importance in the State-wide production summary. However, the Columbia Basin which will exceed the Yakima projects in size by almost 5 times upon completion, should develop into a major waterfowl production area. In anticipation of production possibilities in the Columbia Basin, the southcentral Washington irrigation systems were divided into 5 units based on waterfowl utilization and allied land and water uses. The most important irrigation unit in this region is the irrigable lands of the Yakima Indian Reservation, with an average of 28.89 resident waterfowl and 7.48 broods per square mile in 1952. This land is mostly flat or gently rolling bottomland with a checker-board pattern of irrigation canals, approximately 244 miles of drainage ditches, and is traversed by several winding, sluggish streams. Low crops and pasture land are the most important crops grown in this unit.

Again in 1952, 17 species of ducks, coot, and Canada geese utilized central Washington breeding areas. Mallards, as usual the most abundant species, increased their relative abundance in 1952. Wood ducks were again second in relative breeding importance after relinquishing this position to redheads in 1951. The erratic redhead breeders decreased by almost 40 percent in 1952. Decreased populations of blue-winged teal, pintail, Barrow's goldeneye, and coot were also evident.

The average size of duck broods, two-thirds or more grown, in 1952 was 6.5 young, the same as in 1951. A summary of brood sizes of all species is contained in Table II.

Table II - Average Brood Size of Ducks in Central Washington - 1952

	Class I		Class II		Class III	
Species	No. Broods	Average Size	No. Broods	Average Size	No. Broods	Average Size
Mallard	48	7.6	22	7.0	63	6.4
Gadwall	1	6.0	2	5.5	1	5.0
Pintail	-	-	-	-	1	5.0
Baldpate	-	-	-	-	1	8.0
G-w. teal	-	-	1	11.0	4	6.7
B-w. & cinn. teal	5	5.6	6	5.1	7	6.5
Shoveler	-	-	1	3.0	4	6.7
Wood duck	2	6.0	-	-	4	5.7
Redhead	3	3.7	3	7.0	8	6.0
Ring-necked duck	-	-	3	6.0	3	8.7
Lesser scaup	-	-	-	-	1	10.0
Barrow's goldeneye	-	-	2	6.0	6	6.3
Harlequin	-	-	1	4.0	-	-
Ruddy duck	7	6.5	7	5.1	2	7.0
Merganser	5	5.0	3	5.0	-	-
Total	71	6.5	51	6.0	105	6.5

Western Washington

Counts of broods and territorial pairs of ducks in western Washington indicates approximately a 25 percent increase in mallard production and a 45 percent decrease in wood duck production. The total production index for all species is 11 percent below that of 1951. Brood sizes by age classes averaged 6.4 for all species.

Breeding Trends State-wide

In order to present a uniform production trend for the entire State, the following brood size table is a compilation of all brood counts.

Again during 1952 there was no gross fluctuation in average brood size by age classification. The average brood size of Class III mallards, which are the most abundant breeder in the State was 6.2. This compares very favorably with brood sizes observed during the past 5 years.

From the findings of waterfowl biologists working throughout the State, an estimate of total waterfowl production is made. Table IV is a summary of waterfowl production during the last 3 years.

Table III - Average Brood Size of Ducks for Entire State

Species	Class I No. Broods	Class I Average Size	Class II No. Broods	Class II Average Size	Class III No. Broods	Class III Average Size
Mallard	131	7.6	88	6.8	167	6.2
Baldpate	17	6.2	26	6.2	50	6.5
B-w. & Cinn. teal	30	7.1	28	6.7	26	7.0
Gadwall	29	7.0	32	7.3	14	6.6
G-w. teal	22	7.5	4	6.2	23	5.5
Shoveler	9	8.7	8	5.3	25	5.7
Pintail	20	4.4	22	6.1	31	4.9
Redhead	24	6.3	14	6.5	11	6.0
Wood duck	11	5.6	3	5.0	4	6.7
Ring-necked duck	-	-	3	6.0	3	8.7
Barrow's goldeneye	-	-	2	6.0	6	6.3
Harlequin	-	-	1	4.0	-	-
A. merganser	5	5.0	3	5.0	-	-
Unidentified	17	6.9	13	6.7	19	5.3
Total	315	6.3	247	6.6	379	6.1

Adult resident birds are included in the total waterfowl production estimates. It is believed that the coverage is now adequate for making a total production estimate. Young produced in the State is roughly 70 percent of the total population figure.

Table IV - Waterfowl Production in the Three Divisions of the State - 1950, 1951 and 1952

Major Divisions	PRODUCTION 1950	1951	1952
Western Washington	41,418	35,000	31,000
Central Washington	58,672	63,062	66,910
Eastern Washington	637,336	588,000	617,400
Total State Production	737,426	686,062	715,310

It is significant to note that the waterfowl production for 1952 shows a 4.26 percent increase over 1951.

Canada Goose Production

For the third consecutive year the major breeding grounds of the Canada goose on the Lower Snake and Columbia River systems of southcentral Washington have been inventoried following the pattern established in 1950. This entire area has been designated by units based upon its eventual permanent alteration behind a system of power dams. Unit I is that part of the Columbia River from below Priest Rapids to the town of Richland. This area lies entirely within the Hanford

AEC Reservation and should remain permanently as it now is. Unit II is that portion of the Columbia and the lower few miles of the Snake River which will be completely inundated in the impoundment behind McNary Dam, probably in late 1952. Unit III embraces the future impoundment area of the proposed Celilo Falls Dam and upstream to McNary Dam. Unit IV includes the impoundment area of the proposed Ice Harbor Dam on the Lower Snake River upstream as far as Matthews. Within this river system, a distance of 218 miles, lie 86 islands used as goose nesting habitat. Upon completion of McNary Dam, 24 of these islands in Unit II will be lost for future use. There are 27 islands in Unit III below McNary Dam, 14 in Unit IV, and the remaining 21 in Unit I. Each year, as time and manpower permitted, the amount of river surveyed has been increased. The breeding population figures are then reduced to birds per river mile so that an index can be applied to the entire habitat area. In 1952, 76 islands over a distance of 182 miles were surveyed in April. Most of the islands in Unit I were re-checked in May by General Electric technical personnel from the Hanford AEC for late nesting information.

Nesting and hatching in 1952 was not only earlier than in 1951, but it was completed in a shorter span of time. The first known hatching date in 1951 was April 11 with the peak of the hatch occurring about May 10 to 15. The latest known hatching date was between June 10 and 12. On April 9 in 1952, 2.8 percent of 470 nests observed had already hatched. Over 33 percent had hatched before April 24 and less than 4 percent of the nests were still being incubated on May 13. Prior to banding, late in June, 97 complete and separate broods had been counted with a total of 445 goslings for an average brood size of 4.58, all age classes combined. The average size of 38 broods counted in 1951 was only 3.5 goslings per brood. The average size clutch of 509 nests in 1952 was 5.1 eggs, including incomplete clutches. The nesting loss was 3.7 percent of 509 nests observed. The causes ranged from human theft on one island through several types of predation elsewhere. The lowest nesting loss was 2.9 percent in Unit III up to a high of 9.6 percent on the smaller Snake River in Unit IV.

A 3-year summary of the resident goose population is included in Table V. With the exception of Units II and III, pairs of geese have increased each year throughout the area, although in 1952, the total population dropped. This may have been due to an earlier season in which more of the yearlings and other non-breeders already had departed. Early, inconclusive banding returns indicate that sub-adult geese may spend their yearling summer wandering northward from the breeding grounds in the Pacific northwest. Then, after reaching sexual maturity, they remain south to nest. The greater number of nests observed each successive year does not necessarily indicate a larger nesting population, but rather a more efficient method of locating nests in a shorter period of time on each island as experience is gained. Probably the most accurate indicator of the resident population fluctuation is the pairs of geese counted. The greatest effort is toward making this count as complete and accurate as possible each year. With an average of 4.63 pair of geese for each of the 218 miles, the 1952 breeding population index was 1,010 pair of geese compared with 970 pair in 1951. With nesting losses and average brood size accounted for, the 1952 production index will be about 4,450 young compared to 3,300 in 1951, or an increased production of 25 percent. The goose production figures derived from this river inventory are separate and in addition to those contained in the general waterfowl inventory for the remainder of eastern and central Washington.

Table V - Canada Goose Population Density in Southcentral Washington, 1950-1952

Area	Total Mile of River Habitat	River Miles Inventoried			Pairs of Geese			Total Geese			Nests Observed		
		1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952
Unit I	44	40	40	44	231	243	311	702	780	908	113	146	198
					(5.78)	(6.07)	(7.07)	(17.55)	(19.50)	(20.63)	(2.57)	(3.65)	(4.50)
Unit II	47	47	47	38	173	145	139	688	599	417	47	93	87
					(3.68)	(3.09)	(3.66)	(14.64)	(12.74)	(10.95)	(1.0)	(1.98)	(2.29)
Unit III	92	36	37	65	209	208	303	677	748	803	122	155	172
					(5.81)	(5.62)	(4.66)	(18.80)	(20.21)	(12.34)	(3.39)	(4.19)	(2.65)
Unit IV	35	-	19	35	-	42	91	-	135	291	-	25	52
						(2.21)	(2.60)		(7.11)	(8.31)		(1.32)	(1.49)
Total	218	123	143	182	-	638	844	-	2,262	2,419	-	419	509
						(4.46)	(4.63)		(15.81)	(13.29)		(2.93)	(2.79)

Number in parenthesis is the average per river mile.

Summary of Data

1. Although the spring and summer were excessively dry, temperatures were normal. Waterfowl production was not seriously hampered and shows a favorable increase of 4.26 percent over 1951.

2. The average brood size of Class III mallards, which are the most important breeders in the State was 6.2. This compares very favorably with brood sizes observed during the past five years.

3. Of the ten major species of ducks breeding in eastern Washington, mallards, pintails, baldpates, gadwalls, scaup and ruddy ducks increased considerably in abundance.

4. Blue-winged, cinnamon and green-winged teal, shovelers and redheads show a decrease in production.

5. The 1952 production index of Canada geese on the Lower Snake and Columbia River systems of southcentral Washington will be about 4,450 young compared to 3,300 in 1951, or an increased production of 25 percent.

WATERFOWL BREEDING GROUND SURVEY IN OREGON

William B. Morse

Introduction

The 1952 waterfowl survey was undertaken for the fourth consecutive year. Samples were located in most sections of the State on permanent sample areas.

Methods Used in Sampling

All census measurements are made by district game biologists and are on permanent sample areas. As experience is gained the areas of census are changed.

Other duties of the game biologists do not permit these samples to be as consistent as desirable, however, data from comparable periods are combined for comparitive purposes. Transect methods are used throughout by both foot and car. Fewer samples were taken than in past years and for this reason the data are not as reliable.

Weather and Water Conditions

Weather and water conditions were generally very satisfactory. Substantial amounts of rain fell during June and early July, but did not interfere with nesting or broods. Spring runoff throughout most of Eastern Oregon was near record. In certain areas many goose nests and some duck nests flooded out. Throughout the desert areas potholes were flooded and greatly increased production occurred. Birds were dispersed, and this fact accounts for lowered production on some samples.

Breeding Population Trends

Breeding population trends are shown in Table I. The following changes from 1951 were noted:

Ducks

Western Oregon	+ 74 percent
Eastern Oregon	+ 53 percent
State-wide (estimated)	+ 20 percent

Canada Goose

Eastern Oregon	+ 48 percent

After four years of taking breeding population inventories some question has arisen regarding the suitability of the methods to Oregon conditions. It is believed that many migrant birds are to be found during this inventory period. No consistent correlation can be drawn between the breeding population census and subsequent brood censuses.

Success of the Season

Success of the season is presented in Tables II and V I inclusive. Broods per square mile show a general decrease from previous highs, however, production was better distributed thorughout the season. The hatch was generally earlier and as birds were much more widely distributed than in past years we must interpret the data to indicate an increase of 10 to 20 percent in production for the current year.

Goose broods show a modest decrease. Geese were more widely scattered and we believe the production to be the same as last year.

Table I - Oregon Waterfowl Breeding Population - East of Cascades

	9.5 Square Miles Censused						
		Single	Total	Pairs per Square Mile			
Species	Pairs	Drakes	Pairs	1952	1951	1950	1949
Mallard	106	42	148	15.5	13.5	18.4	7.9
Pintail	6	3	9	0.6	1.7	2.9	1.3
Cinn. teal	98	11	109	11.5	6.7	12.4	9.1
G-w. teal	21	4	25	2.6	1.1	-	-
Gadwall	45	2	47	4.9	3.9	6.5	2.1
Redhead	54	8	62	6.6	2.8	3.7	2.5
Shoveler	12	-	12	1.3	1.7	2.5	-
Ruddy duck	28	25	53	5.3	.6	.9	-
Wood duck	5	1	6	0.6	-	-	-
Total Ducks	375	96	471	49.0	32.0	48.0	23.0
Canada Geese	75	10	85	8.9	6.0	7.6	9.7
	West of Cascades - 21.1 Square Miles Censused						
Mallard	241	121	362	17.1	10.7	3.3	1.6
Pintail	17	4	21	1.0	.26	.47	-
Cinn. teal	2	2	4	0.2	.13	.14	-
B-w. teal	1	-	1	.05	.23	.07	-
Wood duck	186	82	268	12.7	6.5	1.16	.33
Shoveler	1	4	5	0.2	.26	-	-
Total Ducks	448	213	661	31.3	18.0	5.1	2.0
Canada geese	3		3	0.15	-	-	-

Table II - Preliminary Brood Summary - West of Cascades

Period	Young Ducks Per Square Mile			
	1952	1951	1950	1949
June 1st half	10.7	11.6	13.1	5.1
June 2nd half	10.6	8.6	2.4	-
	Young Geese per Square Mile			
June 1st half	2.1	-	-	-

(continued)

Table II - Preliminary Brood Summary - East of Cascades

Period	1952	1951	1950	1949
	Young Ducks per Square Mile			
June 1st half	15.4	3.8	12.8	4.9
July 1st half	14.6	45.6	26.9	8.1
July 2nd half	37.0	164.8	148.6	-
	Young Geese per Square Mile			
June 1st half	16.1	15.8	4.7	1.1
July 1st half	1.1	1.3	16.5	1.6

Table III - Comparative Data - Oregon Duck Brood Census - East of Cascades

Period	Broods Per Square Mile				Young Per Square Mile			
	1952	1951	1950	1949	1952	1951	1950	1949
June 1st half	2.3	0.7	2.0	0.4	17.2	3.8	12.8	4.9
June 2nd half	-	3.1	-	0.6	-	18.0	-	2.8
July 1st half	2.3	6.2	4.0	0.9	14.6	45.6	26.9	8.1
July 2nd half	9.0	21.4	22.2	-	64.0	164.8	148.6	-
August 1st half	32.0	-	-	-	146.5	-	-	-
	West of Cascades							
June 1st half	1.2	1.7	2.3	.9	10.7	11.6	13.1	5.1
June 2nd half	-	1.5	0.6	-	10.6	8.6	2.4	-
July 1st half	1.5	3.3	2.3	.94	-	15.4	8.1	7.1
July 2nd half	4.3	6.8	0.8	-	20.3	53.8	4.6	-

Table IV - Comparative Data - Oregon Goose Brood Census - East of Cascades

Period	Broods Per Square Mile				Young Per Square Mile			
	1952	1951	1950	1949	1952	1951	1950	1949
June 1st half	3.1	3.2	1.0	0.2	13.3	15.8	4.7	1.1
June 2nd half	-	-	6.2	0.2	-	-	39.2	2.0
July 1st half	0.3	0.3	3.3	0.2	0.9	1.3	16.5	1.6
July 2nd half	0.9	-	8.6	-	4.1	-	42.4	-

Table V - Duck Brood Census in Oregon - West of Cascades

Period	Census Area Sq. Miles	Species	Females Counted	Percent Females W/Brood	Average Brood Size Class I	Class II	Class III	Broods / Sq. Mile	Young / Sq. Mi.
June 1st half	5.8	Mallard	127	3.0	11.5	8	-	0.7	6.7
		Wood duck	80	3.7	14.0	6	-	0.5	4.5
		Total	207	3.4				1.2	10.7
June 2nd half	25.1	Mallard	50	44	5.1	6.6	6.0	0.9	5.6
		Wood duck	33	45	10.0	7.7	5.6	0.6	5.0
		Total	88	44				1.5	10.6
August 1st half	6.7	Mallard	20	65	-	5.5	4.5	1.9	9.1
		Wood duck	24	67	-	3.3	5.2	2.4	11.2
		Total	48	66				4.3	20.3
		East of Cascades							
June	14.6	Mallard	78	19	7.7	7.0	-	1.0	7.8
		Pintail	5	40	-	6.5	-	0.1	0.9
		Cinn. teal	15	13	6.0	10.0	-	0.1	1.1
		Gadwall	11	18	9.0	-	10.0	0.1	1.4
		Redhead	19	21	6.7	9.0	-	0.3	2.0
		B-w. teal	1	0	-	-	-	-	-
		Ruddy	14	50	5.4	6.5	-	0.5	2.8
		Shoveler	2	50	4.0	-	-	0.7	2.7
		Wood duck	3	0	-	-	-	-	-
		Total	148	22	-	-	-	2.3	17.2

(continued)

Table V - Duck Brood Census in Oregon - East of Cascades (continued)

Period	Census Area Sq. Miles	Species	Females Counted	Percent Females W/Brood	Average Brood Size Class I	Class II	Class III	Broods/ Sq. Mi.	Young/ Sq. Mi.
July 1st half	16.1	Mallard	21	52	5.2	5.8	6.5	0.7	3.9
		Pintail	3	33	-	-	4.0	0.1	0.4
		Cinn. teal	4	25	6.0	-	-	0.1	0.4
		G-w. teal	3	33	-	5.0	-	0.1	0.3
		Gadwall	18	39	8.2	5.0	5.0	0.4	3.0
		Redhead	15	80	8.5	3.5	-	0.7	5.3
		B-w. teal	2	0	-	-	-	-	-
		Ruddy duck	3	67	5.0	3.0	-	0.2	0.5
		Shoveler	1	0	-	-	-	-	-
		Wood duck	3	67	-	6.0	-	0.2	0.7
		Total	73	51	-	-	-	2.3	14.6
July 2nd half	10.1	Mallard	56	61	9.0	6.1	5.9	3.3	20.6
		Pintail	11	37	8.5	9.0	3.0	0.4	2.9
		Cinn. teal	5	80	10.0	9.0	-	0.4	3.7
		Gadwall	16	100	9.5	8.7	-	1.6	14.3
		Redhead	15	93	8.0	8.6	-	1.4	11.6
		Ruddy duck	8	100	5.2	8.0	-	0.8	4.6
		Scaup	10	60	4.6	7.0	-	0.6	3.0
		Wood duck	4	75	9.0	7.0	-	0.3	1.6
		G-w. teal	2	100	-	-	8.0	0.2	1.6
		Total	127	72	-	-	-	9.0	64.0
August 1st half	3.5 *	Mallard	85	70	8.0	6.0	4.3	17.2	75.0
		Pintail	9	100	-	-	6.4	2.6	16.6
		Cinn. teal	24	50	-	-	7.1	3.4	24.5
		Gadwall	11	82	-	-	7.0	2.6	17.7
		Scaup	12	100	-	-	5.8	3.4	20.0
		Ruddy duck	10	70	-	-	5.0	2.0	12.5
		Wood duck	8	37	-	-	5.0	0.9	4.3
		Total	159	71	-	-	-	32.0	196.5

* Note this is an isolated sample and is not representative at this time of year.

Table V I - Canada Goose Brood Census in Oregon - East of Cascades

Period	Census Area Sq. Miles	Species	Total Females Censused	Percent Females W/Brood	Average Brood Size			Broods/ Sq. Mi.	Young / Sq. Mi.
					Class I	Class II	Class III		
June	14.6	Canada Goose	54	86	3.2	3.8	4.7	3.1	13.3
July 1st half	16.1	Canada Goose	9	45	2.0	-	3.2	0.3	0.9
July 2nd half	10.1	Canada Goose	9	100	-	-	4.7	0.9	4.1

WATERFOWL BREEDING GROUND SURVEY IN CALIFORNIA

John E. Chattin, A. W. Miller and A. E. Naylor *

Introduction

The major waterfowl producing areas of the State have been covered by the breeding ground survey each year for the past four years. By way of review it should be noted that at present 75 percent or more of California's production comes from two areas, the northeastern or "Great Basin" part of the State and the rice growing section of the Sacramento Valley. The northeastern region, which includes the Lower Klamath and Tule Lake Basins, contains over 100 lakes, natural marshes, and artificial water impoundments on which over one-third of the ducks in the State are raised. The scattered distribution of water areas within this great basin type makes it impossible to fly aerial transects. As a result this entire area was given complete aerial coverage of all water and marsh areas to determine total numbers of breeding waterfowl.

The second important waterfowl production area in the State is the valley of the Sacramento River. Under present conditions the Sacramento Valley serves to produce one-third of the State reared waterfowl. The bulk of this area is devoted to intensive agriculture with only a remnant of the once vast marshlands remaining. These remaining marsh and overflow lands are largely in private ownership and are controlled primarily by private duck clubs. Coupled with these remnants of marshlands the culture of rice as a commercial crop is responsible for a large proportion of the waterfowl raised in this area. From late April through the middle of September, over 200,000 acres of shallow stabilized water in the form of contoured rice fields are available to nesting ducks. Before the rice becomes too high, this area can be ideally covered by aerial transect flights. Later in the season, however, brood counting and fall population counts are difficult to accomplish due to the dense cover growth and inaccessible nature of these areas on foot. In contrast to northeastern California, where a variety of waterfowl species nest, the primary species nesting in the Sacramento Valley is mallard.

The remaining portion of the waterfowl produced in California are raised in scattered sections of agricultural and marsh habitat including tidal saltmarsh, stream channels and artificial impoundments. These areas include the Suisan marsh, Sacramento-San Joaquin River delta, the Grasslands in the San Joaquin Valley, etc. Productivity is high on these smaller areas in many cases but is limited in significance by the relatively small size of area and amount of water. Production surveys of these minor areas have been repeated this year only where time and convenience enabled us to do so.

Some additional habitat was available this year in the upper San Joaquin Valley due to the flooding of Tulare, Buena Vista Lakes, and high water in the San Joaquin River channel below Mendota.

*Personnel of Federal Aid in Wildlife Restoration Project - California 30-R cooperated in this study. Credit is also due to the refuge management of Tule Lake National Wildlife Refuge for the gathering of the data on that area.

Scope and Methods

Fundamentally the survey consists of an aerial census of the pairs of ducks present on the breeding grounds during the last half of May and the first half of June, assuming an even sex ratio. Production is based on the number of pairs found, the relative nesting success, and the average brood size on each area. The latter two factors require considerable ground work and it is not always possible to conduct such surveys on each unit every year. An attempt is made to keep the data current on major areas.

Goose production in California is confined to the northeastern section and involves only Canada geese. By June 1 when the survey is made in this region, the nesting season is over for this species and most of the birds are more than half grown. The total number of old and young is counted and this figure is used for the total fall population. This year special attention was given the breeding population of Sandhill Cranes in California and the results are appended to this report, although no comparative data are available. Insofar as possible the areas covered, census routes traveled and methods employed have been duplicated from the pattern established last year. Essentially the same observers have been used in each area as were used in previous years.

All of the aerial transects were flown at elevations of 150 feet at speeds of 85 to 90 miles per hour with two observers covering a ground strip 1/8-mile wide on either side of the airplane. Under these conditions experienced observers can accurately record species and sex of those ducks exhibiting divergent sex characteristics as well as note whether the birds occurred as pairs, singles, or groups of males where the birds are not concentrated. Where complete coverage was made, the reservoir or marsh was circled or traversed at about the same elevation and speed until the observers were satisfied that the majority of the ducks had been seen. It was often possible to get some brood counts at the same time on geese. The airplane used was a Fairchild 24, which is a four-place plane with a high wing. Over 60 hours of flying time was used.

Weather and Water Conditions

California generally experienced one of the heaviest precipitation years on record. The winter was reasonably mild at lower elevations and the heavy snow pack in the high country provided a good water supply. The wintering birds had ample food and left for the breeding grounds in good condition. The spring runoff was great enough to cover many areas which have not been flooded since 1937-38. These furnished additional nesting areas. Conditions were considered nearly ideal over most of the State.

Results

For the following areas comparable data have been gathered in all four years. A standard pattern of reporting has been used to include pertinent facts with reference to individual areas. On a sampling basis, coverage of the entire State production can be considered as essentially complete; thus figures are shown as actual numerical estimates of total numbers rather than as ducks per square mile. Data on individual areas studied are summarized as follows with such remarks as are pertinent. "Total fall population" includes resident adults plus locally reared young.

1. Sacramento Valley
   a. Area - 2,400 square miles.
   b. Type - Agricultural land including 200,000+ acres of rice, plus managed refuges and private gun clubs.
   c. Coverage - 2-1/2 percent aerial 1949, 1950 and 1951, 4-1/2 percent aerial in 1952.
   d. Production summary:

	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Mallard	28,000	28,920	29,240	34,300	140,000	145,000	150,000	171,500
Gadwall	200	120	200	600	1,000	750	1,000	3,000
Pintail	120	40	0	300	600	250	0	1,500
Cinn. teal	600	440	400	1,700	3,000	2,500	2,400	8,500
Redhead	40	0	0	60	200	0	0	300
Shoveler	0	0	80	40	0	0	400	200
Total	28,960	29,480	29,920	37,000	144,800	148,500	153,800	185,000
Coots	500	1,140	1,720	4,500	2,000	5,000	8,000	22,500

   e. Remarks: The Sacramento Valley serves to produce roughly 40 percent of the total waterfowl reared in the State. Mallards are by far the most numerous nesting duck in the area. Under existing agricultural conditions they will probably continue in this role. This area shows an indicated increase of 23 percent in ducks and a much larger increase in Coots. In previous years the Sacramento Valley has had over 40 percent of the breeding pairs of ducks in the State. The increase noted is considered to be significant. The coverage was increased this year to further substantiate this indicated increase.

2. Suisun Marsh
   a. Area - 140 square miles.
   b. Type - Natural tidal marsh, private gun clubs and agricultural land.
   c. Coverage - Aerial: 6 percent in 1949, 5-1/2 percent in 1950, 5 percent in 1951, 5 percent in 1952.
   d. Production Summary:

	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Mallard	3,485	1,913	980	3,640	18,000	10,000	5,000	18,100
Gadwall	187	180	340	480	950	900	2,000	2,500
Cinn. teal	68	54	100	580	350	350	550	2,900
Others	50	180	20	180	250	1,000	100	900
Total	3,790	2,327	1,440	4,880	19,550	12,250	7,650	24,400
Coots	-	-	-	180	-	-	-	900

   e. Remarks: Figures this year indicate a 240 percent increase in nesting duck pairs. In past years this area had about 2 percent of the total nesting pairs in the State. This large increase is significant locally.

3. North San Francisco Bay
   a. Area - 36 square miles in 1949, 30 square miles in 1950, 1951 and 1952.
   b. Type - Tidal salt marsh, gun clubs, river delta pasture land.
   c. Coverage - Aerial 12-1/2 percent in 1949, 10 percent in 1950, 15 percent in 1951 and 1952.
   d. Production Summary:

Species	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Mallard	575	806	560	480	2,800	4,000	2,700	2,400
Gadwall	40	56	73	130	200	300	350	650
Pintail	5	9	7	30	25	50	35	150
Shoveler	10	9	7	10	50	50	40	50
Ruddy duck	0	74	0	60	0	350	0	300
Others	-	-	-	140	-	-	-	700
Total	630	954	647	850	3,075	4,750	3,125	4,250

   e. Remarks: Essentially the same as previous years.

4. North San Joaquin Valley (Grasslands)
   a. Area - 150 square miles.
   b. Type - Gun clubs and intermittently flooded pasture lands.
   c. Coverage - Aerial 25 percent in 1948, 1949, 1950, 1951 and 1952.
   d. Production Summary:

	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Mallard	1,216	1,304	1,703	2,070	5,400	6,600	8,500	10,350
Gadwall	156	56	192	280	675	300	1,000	1,400
Pintail	16	24	100	30	75	150	500	150
Shoveler	24	8	12	50	100	60	70	250
Redhead	28	20	88	20	130	100	450	100
Tree duck	0	6	0	0	-	40	0	-
Ruddy duck	12	32	28	0	50	180	160	-
Cinn. teal	192	76	173	340	950	500	900	1,700
Total	1,644	1,526	2,295	2,790	7,380	7,930	11,580	13,950
Coots	400	446	724	960	1,600	2,000	3,500	4,800

   e. Remarks: 20 percent increase. Nesting pairs in previous years amounted to about 2 percent of the State total. Increase is significant in this local area but not on a State-wide basis.

5. Northeastern California

a. Area - Not determined.

b. Type - Natural marshes, lakes and artificial impoundments.

c. Coverage - Aerial, complete 1949, 1950, 1951 and 1952 supplemented by ground checks.

d. Production Summary:

Species	Estimated Total Nesting Pairs 1949	1950	1951	1952	Total Fall Population 1949	1950	1951	1952
Canada Geese	1,460	1,950	2,000	2,560	9,538	12,000	13,350	14,200*
Mallard	2,550	2,650	4,460	7,120	9,900	10,500	23,540	50,980
Gadwall	2,240	1,660	1,470	820	8,300	9,000	9,250	6,810
Pintail	1,400	1,750	1,970	2,440	5,350	6,800	7,190	16,230
G-w. teal	50	10	30	40	150	60	140	200
B-w. teal	115	15	20	20	430	680	110	120
Cinn. teal	2,600	2,360	1,150	770	9,600	14,000	5,400	4,840
Shoveler	600	670	235	250	2,200	2,900	1,500	1,880
Redhead	440	520	875	430	2,500	3,000	4,770	2,410
Scaup	70	60	150	140	400	400	880	1,010
Ruddy duck	540	275	290	100	2,500	1,800	1,500	440
Others	280	250	320	90	1,200	1,200	1,740	480
Total (ducks)	10,885	10,220	10,970	12,220	42,530	50,340	56,020	85,400
Coots	1,020	1,450	1,710	1,650	4,150	7,400	12,800	9,770

* This figure includes 3,260 non-breeding birds.

e. Remarks: This area has shown an increase of about 20 percent in the nesting population over last year. The ideal weather and water conditions prevailing throughout the season increased brood survival which resulted in a significant increase in production to approximately 50 percent higher than last year.

6. Tule Lake, Lower Klamath Refuges (Klamath Basin).

a. Area - 35,000 acres of water and marsh with surrounding cultivated grain lands.

b. Type - Great Basin. Natural and managed marsh areas.

c. Coverage - Ground observation (1949, 1950, 1951, 1952, supplemented with aerial counts in 1952).

d. Production Summary:

Species	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Canada geese	2,600	1,300	1,500	640	16,900	10,300	11,500	5,040*
Mallard	3,500	3,250	3,600	2,270	26,000	26,300	27,500	18,600
Gadwall	3,500	5,500	6,000	3,200	30,000	48,100	50,000	27,200
Pintail	380	505	400	440	3,625	6,510	3,400	3,230
G-w. teal	150	80	100	0	1,700	1,100	1,000	0
B-w. teal	250	295	150	100	2,200	2,560	1,250	710
Cinn. teal	1,700	2,300	2,000	1,210	16,000	23,000	18,000	9,100
Shoveler	550	510	600	760	6,400	5,900	6,000	6,080
Redhead	4,300	5,000	4,800	2,800	31,000	49,400	45,000	22,100
Scaup	800	850	1,000	150	6,000	8,400	9,000	1,230
Ruddy duck	2,000	3,200	5,000	1,350	18,000	29,900	38,000	8,600
Others	300	260	300	20	3,000	2,400	3,000	140
Total (ducks)	17,430	21,750	23,950	12,300	143,925	203,570	202,150	96,990
Coots	5,000	5,000	6,000	3,900	31,500	36,000	40,000	24,000

* Includes 1,600 non-breeding birds.

e. Remarks: This important area has experienced significant changes in personnel and methods of estimating waterfowl production. The 1952 figures indicate an approximate 50 percent decrease in nesting ducks and a 65 percent decrease in nesting Canada geese. This decrease almost certainly does not represent a change in population but rather a change in subjective appraisal. The figures are included for the purpose of establishing a future reference point in subsequent years.

7. South San Joaquin Valley.

a. Area - Not determined.
b. Type- Flooded river channel, old lake bottoms and agricultural land.
c. Coverage - Aerial - approximately 15 percent.
d. Results:

Species	Estimated Total Nesting Pairs
Mallard	1,700
Gadwall	290
Cinn. teal	190
Redhead	70
Pintail	40
Shoveler	10
Tree duck	20
Total	2,320
Coots	2,600

e. Remarks: This area affords nesting habitat only occasionally. During the previous four years this region was so dry that no survey was made, and so we have no comparative data. Also we have no data on the average nesting success or brood size on which to base production. The above total is not included in the State-wide totals and is included in the report only for future comparison.

8. State-wide Trend.

A comparative summary of nesting pairs of waterfowl for the past four seasons together with final fall population including young plus resident adults is shown in the following table. These figures for each year have been derived from the preceding tables. In almost all cases the figures shown previously for "nesting pairs" are more accurate than those indicating "total fall population." The 1952 figures are not directly comparable since basic changes were made on Tule Lake and Lower Klamath refuges in 1952.

	Estimated Total Nesting Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Canada geese	4,060	3,250	3,500	3,200	26,438	22,300	24,850	19,240
Mallard	39,326	38,843	40,543	49,880	202,100		217,240	271,930
Gadwall	6,323	7,572	8,275	5,510	41,125	59,350	63,600	41,560
Pintail	1,921	2,328	2,477	3,240	9,675	13,760	11,125	21,260
Cinn. teal	5,160	5,230	3,823	4,600	29,900	40,350	27,250	27,040
G-w. teal	200	90	130	40	1,850	1,160	1,140	200
B-w. teal	365	395	170	120	2,630	3,240	1,360	830
Redhead	4,808	5,540	5,763	3,310	33,830	52,500	50,220	24,810
Shoveler	1,184	1,197	934	1,110	8,650	8,910	8,010	8,460
Scaup	870	910	1,150	290	6,400	8,800	9,880	2,240
Ruddy duck	2,552	3,581	5,318	1,510	20,550	32,230	39,660	9,340
Others	630	696	640	430	4,450	4,640	4,840	2,220
Total (ducks)	63,339	66,342	69,222	70,040	361,660	427,340	434,325	409,890
Coots	6,920	8,036	10,154	11,190	39,250	50,400	64,300	61,970

State-wide Trend excluding Tule Lake and Lower Klamath.

In view of the basic changes made on the Tule Lake-Lower Klamath areas, the only set of comparable figures on nesting pairs and production is presented in the following table. The figures shown in this table have been extracted and combined from the previous sections of this report.

Remarks: Comparable figures from previous years indicate that there was a continued increase in the Canada goose population. A significant increase is noted in mallards, pintail and cinnamon teal, whereas the production of redheads and ruddy ducks shows a decrease. The other duck species remain essentially the same. An over-all increase of approximately 30 percent is indicated for ducks and a 50 percent increase in coots.

Species	Estimated Breeding Pairs				Total Fall Population			
	1949	1950	1951	1952	1949	1950	1951	1952
Canada geese	1,460	1,950	2,000	2,560	9,538	12,000	13,350	14,200
Mallard	39,326	35,593	36,943	47,610	176,100	176,100	189,740	253,330
Gadwall	2,823	2,072	2,275	2,310	11,125	11,250	13,600	14,360
Pintail	1,541	1,823	2,077	2,800	6,050	7,250	7,725	18,030
Cinn. teal	3,460	2,930	1,823	3,390	13,900	17,350	9,250	17,940
G-w. teal	50	10	30	40	150	60	140	200
B-w. teal	115	100	20	20	430	680	110	120
Redhead	508	540	963	510	2,830	3,100	5,220	2,710
Shoveler	634	687	334	350	2,350	3,010	2,010	2,380
Scaup	70	60	150	140	400	400	880	1,010
Ruddy duck	552	381	318	160	2,550	2,330	1,500	740
Others	330	436	340	410	1,450	2,240	2,000	2,080
Totals	45,909	44,592	45,273	57,740	217,335	223,770	232,175	312,900
Coots	1,920	3,036	4,154	6,290	7,750	14,400	24,300	37,940

Nesting Studies

Goose nesting studies were carried on at Honey Lake Refuge, along the Susan River, and at Tule Lake and Lower Klamath National Wildlife Refuges.

Fate	Susan River	Honey Lake Refuge	Tule Lake and Lower Klamath Refuges	Weighted Average
Hatching success	79	65	79	76
Destroyed by Predator	12	21	3	11
Flooded	-	-	5	2
Deserted	9	14	11	10
Unknown	-	-	2	1
(Percent)	100	100	100	100
Total number of Nests found	57	58	201	316

Along the Susan River 3.6 Canada goose nests were found per mile.

A Duck Nesting Study was conducted on Tule Lake and Lower Klamath National Wildlife Refuges. The approximate mean hatching success for 8 species was 78 percent. Over 1,000 nests were located. Complete data will be published later.

Banding

During the summer and fall 12,285 ducks, 742 Canada geese and 81 coots were banded on four major waterfowl areas prior to September 1. Species, sex and age data are presented in the following table:

California Waterfowl Banding Summary

June to September - 1952

Species	Adult Male	Immature Male	Adult Female	Immature Female	Unclassified	Total
Mallard	315	1,152	122	930	-	2,519
Pintail	1,326	4,667	311	2,501	2	8,807
Gadwall	-	170	2	150	-	322
Baldpate	2	1	0	3	-	6
Cinnamon teal	3	138	8	194	-	343
G-w. teal	2	5	0	3	-	10
Shoveler	1	2	1	2	-	6
Wood duck	2	0	0	1	-	3
Redhead	0	112	0	82	-	194
Lesser scaup	0	36	0	33	1	70
Ruddy duck	0	2	1	2	-	5
Coot	-	-	-	-	81	81
Canada geese	74	-	77	-	591	742

Miscellaneous

During the breeding ground survey in Northeastern California a total of 107 Sandhill cranes was observed. Of this total there were 39 pairs, 16 young, 10 in groups and 3 single birds. In addition, a total of 9 eggs was also recorded in nests which could not be checked for subsequent hatching results.

WATERFOWL BREEDING GROUND SURVEY IN NEVADA

Fred E. Wright*

Introduction

The production trend areas established during the past two summers were covered as completely as possible between May and August of the 1952 breeding season.

Production information received from Stillwater Wildlife Management Area, Ruby Lake National Wildlife Refuge and Sheldon National Antelope Refuge is also included.

Methods

No new trend areas were established this year except for geese, and it was necessary to eliminate several duck nesting areas as time would not permit adequate coverage. The aerial transects on the Humboldt River were also eliminated due to the pressure of other work.

Weather and Water Conditions

Weather conditions were favorable through the spring and early summer. In the northern part of the State spring was considered late and scattered summer thunder showers were frequent.

The heavy snow pack, restored ground water levels, the late spring and cloudy weather which lowered the evaporation rate, all contributed to above normal runoffs and high water levels throughout most of the State.

Stream flows varied from 140 percent to 307 percent of the 50 year normal. Most storage reservoirs released water through the spring to provide a storage for the expected high summer runoff. Many controlled reservoirs did not fill until the middle of July. Water levels in Ruby Valley and the Humboldt Sink area were the highest they had been for many years. The water level in the St illwater marsh was again high, but remained relatively stable through the nesting season. Washoe Lake was higher than the previous year which caused the flooding of more nesting islands.

Breeding Population Trends

Breeding populations in general were up throughout the State. The Sheldon National Antelope Refuge held a nesting population that was slightly higher than last year. On the Stillwater Wildlife Management Area there was a 31 percent increase

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* Information was contributed by Baine Cater, Refuge Manager, Ruby Lake National Wildlife Refuge; Ben Hazeltine, Refuge Manager, Sheldon National Antelope Refuge; and David Marshall, Wildlife Management Biologist, Stillwater Wildlife Management Area.

in nesting pairs, 10 percent of which occurred on the Stillwater marsh; the remainder was attributed to an abundance of water at the Pelican Island area which is located at the mouth of the Carson River, an area that is usually dry. The water level in the Stillwater marsh is higher this year than the two previous breeding seasons and new fringe areas were flooded and used by puddle ducks. A change in the relative abundance of species resulted with a 14 percent increase in puddle ducks and an 18 percent decrease in divers. The nesting density for the area also decreased.

Table I - Numbers of nesting pairs for Stillwater Wildlife Management Area 1950 through 1952

Species	1950	1951	1952	Percent Change 1951 - 1952
Canada geese	15	32	30	- 6
Mallard	100	172	554	+222
Gadwall	200	251	449	+ 79
Baldpate	10	15	25	+ 67
Pintail	20	33	75	+127
Green-winged teal	0	3	12	+300
Blue-winged teal	0	0	7	+700
Cinnamon teal	340	762	1,149	+ 51
Shoveler	15	53	18	- 66
Redhead	650	1,427	1,214	- 15
Ruddy duck	20	60	145	+143
Total Ducks	1,355	2,776	3,648	+ 31
Coot	1,500	1,668	2,174	+ 30
Total Waterfowl	2,870	4,476	5,852	+ 31

Duck Production

From Table II for the reservoir trend areas in northern Nevada (Unit II) there is an indicated decrease in production which is in part due to the large drop in numbers of mallard and pintail broods and young that were recorded. However, all of the periods of observation are not comparable for both years. The first observations this year were later, resulting in a low count on Class I's and a high count on Class III's. By extracting the data for the first half of August for both years there were 86 broods of all classes seen in 1951, and 85 broods of all classes seen for the same period in 1952, indicating little change in production.

There are several possibilities in regards to the mallard and pintail production picture. The early nests could have been unsuccessful due to rising water conditions on the reservoir areas or some could have failed due to cold weather. Another possibility was that the abundance of water throughout the general area reduced the nesting density of these two species on the trend areas. Gadwall and lesser scaup production increased while the production for the other species was in general comparable for both seasons.

Table II - Totals of all brood classes by species for 1951 and 1952 on Reservoir Trend Areas

Species	Broods		Young		Average	
	1951	1952	1951	1952	1951	1952
Mallard	70	25	421	158	6.02	6.33
Pintail	54	25	327	139	6.06	5.57
Gadwall	66	91	535	581	8.12	6.34
Cinnamon teal	23	26	136	105	5.92	4.04
G-w. teal	7	8	49	50	7.0	6.25
Shoveler	1	-	6	-	6.0	-
Redhead	7	6	33	30	4.72	5.0
Lesser scaup	13	24	66	160	5.08	6.68
Baldpate	4	2	24	18	6.0	9.0
Total	245	207	1,597	1,241	-	-

Duck production at Ruby Lake National Wildlife Refuge appears about the same as in 1951 or slightly better as are the production results at Sheldon National Antelope Refuge (Unit I.)

Table III - Summary of Duck Brood Count Data for 1951 and 1952 at Ruby Lake National Wildlife Refuge

Species	1951		1952	
	Broods	Young	Broods	Young
Mallard	26	126	18	98
Pintail	2	11	-	-
Gadwall	5	41	4	23
Cinnamon teal	13	85	13	89
Shoveler	2	6	1	3
Redhead	39	227	32	195
Canvasback	63	317	30	163
Lesser scaup	5	24	-	-
Ruddy duck	9	59	23	148
Ring-necked duck	1	7	-	-
Unidentified	-	-	46	292
Total	165	903	167	1,011
Average brood size	5.47		6.06	

In westcentral Nevada (Unit IV) after extracting comparable data for both seasons observations, the duck production shows a 2.6 percent increase; or for all practical purposes production was about the same in 1952 as compared to 1951. The Stillwater Wildlife Management Area also in Unit IV shows a 1.33 percent decrease; therefore production can be considered the same in 1952 as in 1951 in westcentral Nevada.

Table IV - Totals of all Brood Classes by Species for 1951 and 1952 on Trend Areas in Westcentral Nevada

Species	Broods		Young		Average	
	1951	1952	1951	1952	1951	1952
Mallard	27	23	209	168	7.74	7.31
Cinnamon teal	34	13	207	83	6.1	6.38
Pintail	12	8	68	53	5.66	6.62
Redhead	87	42	594	240	6.83	5.72
Ruddy duck	24	11	182	68	7.60	6.17
Lesser scaup	-	1	-	8	-	8.0
Baldpate	2	3	9	24	4.5	8.0
Gadwall	28	34	213	223	7.62	6.56
Shoveler	5	-	29	-	5.8	-
Total	219	135	1,511	867	6.91	6.43

Table V - Waterfowl Production on the Stillwater Wildlife Management Area for 1951 and 1952

Species	1951	1952	Percent Change
Canada geese	90	75	- 17
Mallard	841	2,454	+302
Gadwall	1,332	2,608	+ 96
Baldpate	79	108	+ 37
Pintail	152	220	+ 45
Green-winged teal	?	18	+ ?
Blue-winged teal	-	?	?
Cinnamon teal	3,745	4,113	+ 10
Shoveler	253	45	- 82
Redhead	6,751	3,388	- 54
Ruddy duck	240	171	- 28
Total ducks	13,393	13,214	- 1.33

Goose Production

June 1 of last year was the first season that a survey of goose production had been undertaken. At that time the young at Washoe Lake were mostly Class II's and some Class I's, while at Lahontan and Pyramid Lakes the groups were Class III. This year the goose production survey was begun in April when 52 goose nests containing 279 eggs were located at Washoe Lake. Early checks at the other areas revealed scattered pairs. By June the Class I's and II's were found at Washoe Lake; and only 21 young at Lahontan Reservoir; and two Class II's at Pyramid Lake. It now appears that the 1,923 geese at Pyramid Lake, the 208 at Lahontan Reservoir and the 85 at Walker Lake this year were molting non-breeders, with some production occurring at Lahontan Reservoir.

In considering those areas where comparable production data is available for both years, there was an 18.2 percent decrease in goose production this year.

Table VI - Goose Production

Area	Broods	Young	Average	Total Adults	Total Geese
Unit I	30	140	4.66	100	240
Unit II - Jiggs	8	35	4.38	55	90
Unit II - Ruby Lakes	18	67	3.72	36	103
Unit III - Washoe Lake	34	154	4.54	245	400
Unit III - Carson Valley	10	47	4.70	29	76
Unit III - Pyramid Lake	-	-	-	-	1,923
Unit IV - Lahontan Reservoir	-	21	-	208	229
Unit IV - Walker Lake	-	-	-	-	85
Unit IV - Stillwater WMA	-	75	-	60	135
Total	-	539	-	-	3,281

Summary

In general the breeding population this season was as large to slightly larger than the previous season, and an abundance of surface water throughout the main duck nesting areas reduced the nesting density.

It is felt that a reduction in duck production on the established trend areas was compensated for by more water areas being available this year.

The large drop in mallard and pintail broods on the reservoir trend areas in northern Nevada could be attributed to the water conditions present this year.

On the basis of brood data gathered the species in order by number of young seen for the State was cinnamon teal, redhead, gadwall, mallard, pintail, ruddy duck, green-winged teal, baldpate, lesser scaup, canvasback and shoveler.

Cinnamon teal replaced redheads in first position this year compared to last year; the other species of the top five held their same positions both years.

Goose production based on comparable data shows an 18.2 percent decrease.

Banding

Table VII - Summary of Summer Banding

Species	MALE			FEMALE			Unclassified	Total
	Local	Immature	Adult	Local	Immature	Adult		
Mallard	12	46	4	3	32	12		109
Gadwall	3	-	-	-	-	-		3
Baldpate	6	-	-	3	1	-		10
G-w. teal	-	32	14	-	30	3	1	80
Cinn. teal	1	14	1	-	19	-	-	35
Pintail	-	59	34	-	25	13	-	131
Redhead	12	70	1	22	62	14	-	181
Total	34	221	54	28	169	42	1	549

WATERFOWL BREEDING GROUND SURVEY IN IDAHO

Robert L. Salter

The waterfowl management survey carried under Federal Aid Project 84-R was continued in Idaho during the 1952 season. More responsibility for the gathering of data was detailed to District Biologists Alvard Kiler, Charles Blake and Elwood Bizeau. Mr. F. Sheldon Dart, Refuge Manager, Deer Flat National Wildlife Refuge cooperated as in the past on the goose nesting work on the lower Snake River. Federal refuge managers Dart and Wallace Leonard contributed brood count data gathered on their refuges. Henry M. Reeves submitted brood count data collected while working on Federal Aid Project 106-R. Conservation officers of the Fish and Game Department furnished the results of waterfowl brood counts taken while engaged in routine activities.

Weather, Water and Migration

March, 1952, was one of the coldest on record. When it did begin warming up in April, the process was gradual and irregular. As a result of the late spring, waterfowl nesting was delayed about two weeks later than in 1951. Many areas of the State had a record or near-record total snowfall during the past winter. The very definite danger of spring floods was minimized by the late spring. Flooding occurred on the lower Snake River, the Big and Little Wood Rivers and the Portneuf River. The only area in which the flooding materially affected waterfowl was in the lower Snake River where a number of Canada goose nests were flooded out. The heavy snow pack insured adequate permanent water in nesting and brooding areas throughout the season.

The spring migration through Idaho was somewhat later than last year. It proceeded at an orderly rate, however. There was no prolonged concentration in any area.

Goose Nesting Study

The Canada goose nesting study on the lower Snake River and Blackfoot Reservoir was continued for the third year. The Homedale Unit work was done in cooperation with Mr. F. Sheldon Dart, Refuge Manager, Deer Flat National Wildlife Refuge.

On the Glenns Ferry and Homedale units it is possible to make direct comparisons with previous years. These areas have been surveyed in the same manner each year. The nest success on the Glenns Ferry unit was somewhat higher this year than in the two previous years. There are really not enough nests involved here to make the difference significant.

The Homedale unit definitely had a higher breeding population of geese this year than in 1951. The same islands were checked in the same manner by the same personnel. In 1951, 151 nests were located compared to 208 in 1952. However, the anticipated gain in production did not materialize. Of the total nests, 125 were on islands in the stretch of river between Ontario, Oregon and Olds Ferry, Idaho.

This section of river, fed by heavy flows from the Owyhee, Boise, Payette and Weiser Rivers, was in flood stage during the last two weeks of April. The river level at Weiser, Idaho was the highest since the flood of 1910. Approximately one-third of the goose nests under observation in this area were flooded out by the high water. Even with this loss, the total production here was estimated to be very nearly that of 1951. The increase in nesting pairs more than offset the unusually heavy loss due to flooding.

The nest success ratio (75.8 percent) at Blackfoot Reservoir, while not as favorable as 1951 (81 percent), is very close to that observed in 1950 (76 percent). No comparison can be drawn on the basis of total nests since several more islands were searched this year than in any previous year.

As in 1951, one large island was searched for nests in Island Park Reservoir. Last year, 42 nests were found but only 16 were located this year. There is no reason known for this drop in nesting birds.

Brood Counts

Waterfowl brood counts were taken by Biologists, Federal Refuge Personnel, and Conservation Officers with primary emphasis being placed on determination of brood survival. The results given in Table II are from southern Idaho only. Lack of personnel prevented the gathering of an adequate sample from the northern part of the State.

Banding

In cooperation with G. Hortin Jensen, Flyway Biologist, Fish and Wildlife Service, Canada goose banding work was continued on Blackfoot Reservoir and Island Park Reservoir. Some late summer duck banding on Island Park Reservoir was done by Elwood Bizeau. The results are given in Table III.

Table I -- Results of Canada Goose Nesting Survey in Idaho - 1952

	Glenns Ferry	Homedale	Blackfoot Reservoir	Island Park Reservoir
No. nests found	24	208	103	16
No. nests terminated	24	205	99	16
No. successful nests	16 (67%)	103 (50%)	75 (76%)	12 (75%)
No. unsuccessful nests	8 (33%)	102 (50%)	24 (24%)	4 (25%)
Average clutch	5.8	5.2	5.0	4.3
Average hatch	5.1	4.7	4.7	4.0

Table II -- Idaho Brood Counts, Summer 1952

Species	Class I		Class II		Class III	
	No. Broods	Average	No. Broods	Average	No. Broods	Average
Mallard	108	7.2	90	5.6	71	6.1
Pintail	21	6.1	14	6.1	15	4.8
Gadwall	41	7.6	9	6.4	9	4.9
Baldpate	3	7.7	6	7.6	2	5.5
Shoveler	3	9.0	10	5.7	8	7.0
Teal (all species)	21	8.0	8	6.1	18	6.1
Canvasback	4	6.5	3	4.7	4	5.2
Redhead	59	7.5	27	6.0	13	6.4
Ruddy	29	6.2	12	5.9	4	4.0
Scaup	28	8.1	25	5.3	3	6.0
Total	317	7.3	204	5.8	147	5.9

Table III -- Idaho Banding Data - Summer 1952

Area and Species	MALE			FEMALE			
	Adult	Immature	Local	Adult	Immature	Local	N. A.
Blackfoot Reservoir							
Canada Geese	16	-	74	17	-	63	-
Island Park Reservoir							
Canada Geese	2	-	-	-	-	-	-
Mallard	31	37	-	19	51	-	1
Pintail	138	116	-	109	95	-	-
G-w. Teal	1	2	-	-	2	-	-
Gadwall	-	1	-	-	-	-	-

WATERFOWL BREEDING GROUND SURVEY IN UTAH

Noland F. Nelson and Albert T. Klett

Survey Methods

Aerial transects over Cache, Weber, and Box Elder Counties were established and flown in 1950. These same transects were retraced in 1951, with the exception of the Cache County area; and new transects were flown over Davis, Salt Lake and Utah Counties. Only scattered birds were found along transects in Cache County, so this area was dropped from the 1951 flights. The 1952 flights covered the same routes that were flown in 1951. The flight transects were located by prominent landmarks such as roads, dikes, and powerlines. These strips were covered by the standard method of counting an eighth-mile on each side of the plane. Most of the important breeding grounds in northern Utah are covered by these flights.

The concentrated nature of the breeding grounds of northern Utah make it possible to get a high percent of coverage with a limited amount of hours flying. Large concentrations of ducks make it impossible to make a species composition or breeding pair breakdown from the air, so it is necessary to make ground counts along the transect routes to get an accurate determination of the composition of birds counted on the flights.

Estimates of the potential breeding population of State refuges have been made each year. This estimate is tabulated by a dike line census at weekly intervals during May. Counts are made of pairs and lone males to arrive at the total number of breeding pairs.

Brood counts and nesting studies were carried on at refuges to determine nesting success, predation losses, brood survival, etc.

Weather and Water Conditions

In Utah this past winter, record snows were deposited in the mountains. Winter weather continued through the entire month of March. March, which is normally rather mild, was characterized by blizzards and a freezing over of the marshlands. This prolonged winter caught many of the early migrant waterfowl in northern Utah. A mild period during February brought thousands of birds into the north end of the state. Avocets perished by the hundreds in a few days' exposure to a severe mid-March blizzard. Snow covered the ground at a time when Canada geese are normally starting to lay their eggs. Many ducks which may have nested in this area may have moved out during the bad storms in March.

Record floods came down most of the streams in northern Utah. The water remained high for a long period during the spring, but little flooding of nests resulted as the ducks had not started to nest when the high water started, and were forced to establish nests on high ground.

Large areas of new ground were flooded during the spring runoff. This, no doubt caused a scattering of ducks to these new areas and could account for a reduction in the number of birds counted along established aerial transect routes.

After the spring floods subsided, the nesting and brooding conditions in the State were excellent. Preliminary counts indicate a high hatch with large broods on most areas.

Aerial Census

There were only six hours of flying time on the 1952 census which covered 289 linear miles and 72.1 square miles. There was a reduction in the number of birds counted on most areas. A total of only 3,865 ducks were counted as compared with 5,509 on the 1951 flights, or a reduction of 76.4 to 53.6 birds per square mile. The following table gives a summary of counts on all transects.

Table I - Total Ducks Counted Along Aerial Routes over Northern Utah Marshes 1951 and 1952

Route	Miles Flown	Square Miles	Total Ducks 1951	Total Ducks 1952	Ducks Per Square Mile 1951	Ducks Per Square Mile 1952
East Box Elder	48	12.0	744	703	62.0	58.6
Weber County	26	6.5	477	401	73.4	61.7
West Box Elder	32	8.0	810	457	101.2	57.1
East Davis	33	8.2	600	437	72.6	53.3
West Davis	24	6.0	781	281	130.2	46.8
Jordan River Clubs	27	6.7	1,436	663	212.8	99.0
Salt Lake County	27	6.7	116	277	17.2	41.3
Utah County	72	18.0	545	646	30.3	35.9
Total	289	72.1	5,509	3,865	76.4	53.6

The decrease in the number of birds counted on the routes this year may not necessarily indicate a large reduction in the breeding population. Large areas of ground were covered with water and the birds were no doubt more dispersed. The large decline in Davis County could have been brought about by the large rise in Great Salt Lake covering some of the breeding grounds in this area.

Counts of pairs and lone males along the transect routes by ground observation showed that the flights were made at a time when a good sample of the breeding population could be obtained. Species such as mallard and pintail which had already started to nest showed a high proportion of lone males with few pairs. Other species, such as redhead, showed a high proportion of pairs. There were also very few birds present which are non-breeders for this area, such as lesser scaup.

A summary of the species of ducks counted on the flights showed that the redhead was the most abundant. Others prominent in the counts were cinnamon teal, mallard, and gadwall. Most of the birds counted were on open water areas which would account for the prominence of the redhead. The composition of birds counted along the flight routes would not be the actual composition of the breeding population, as mallards and pintails were already nesting and would be in farm areas that would be missed by the counts.

Table II - Composition of Ducks Observed in Ground Counts on Aerial Transect Routes - 1952

Species	Pairs	Lone Male	Lone Female	Unclassified	Total	Percent
Redhead	481	251	5	624	1,842	37.9
Cinnamon teal	369	362	17	100	1,217	25.0
Mallard	93	245	11	19	461	9.6
Gadwall	177	39	2	25	420	8.6
Ruddy duck	9	7	4	482	511	10.6
Shoveler	40	55	1	-	136	2.8
Pintail	35	108	7	-	185	3.8
Green-winged teal	1	2	-	36	40	0.8
Blue-winged teal	4	7	-	-	15	0.3
Lesser scaup	5	4	-	11	25	0.4
Baldpate	3	2	-	-	8	0.2
Total	1,217	1,082	47	1,297	4,860	100.0

Ground Counts

Counts of lone males and pairs on State refuges indicated that the potential breeding population on these areas had increased over 1951. There was a marked increase in Cinnamon teal on all areas. The Canada goose population declined on Ogden Bay.

Table III - Estimate of Total Breeding Pairs on State Refuges from Dike Line Census 1951 and 1952

Species	Ogden Bay		Farmington Bay		Public Shooting Grounds	
	1951	1952	1951	1952	1951	1952
Canada geese	142	118	68	75	34	32
Mallard	260	325	137	125	115	200
Gadwall	244	317	88	150	64	35
Pintail	154	225	76	55	71	55
Cinnamon teal	365	625	180	225	172	175
Redhead	388	510	173	220	261	230
Shoveler	180	63	69	63	34	25
Green-winged teal	2	2	-	-	-	-
Blue-winged teal	12	22	5	4	7	3
Ruddy duck	32	18	17	16	3	3
Baldpate	-	2	-	-	-	-
Total	1,779	2,227	813	933	761	758

Table IV - Nesting Success at Ogden Bay Refuge, 1952

Species	Total Nests	Not Successful		Successful		Average Number Eggs	
		Number	Percent	Number	Percent	Laid	Hatched
Mallard	62	38	61.2	24	38.8	8.3	5.4
Cinn. teal	74	46	62.1	28	37.9	9.4	5.7
Gadwall	81	57	70.4	24	29.6	10.3	6.4
Pintail	52	33	63.4	19	36.6	7.8	4.4
Canada geese	10	10	100.0	-	-	5.4	4.5
Shoveler	16	8	50.0	8	50.0	8.9	4.1
Redhead	27	18	66.7	9	33.3	11.1	2.4
Total	322	210	65.2	112	34.8	8.7	4.7

Table V - Fate of Eggs in Nests Under Observation at Ogden Bay - 1952

Species	Number Eggs	Number Hatched	Deserted	Left In Nest	Destroyed			
					Flooded	Gulls	Skunks	Unknown
Mallard	449	316	6	30	9	79	21	38
Cinn. teal	664	401	40	39	32	91	4	57
Gadwall	813	514	41	47	22	68	58	63
Pintail	387	220	18	26	-	45	10	68
Canada geese	54	45	-	9	-	-	-	-
Shoveler	143	66	16	11	19	15	8	8
Redhead	300	127	38	64	24	23	11	13
Total	2,860	1,689	159	226	106	321	112	247
Percent		59.1	5.6	7.9	3.7	11.2	3.9	8.6

Summary

1. The Utah Fish and Game Department continued the aerial breeding ground survey of northern Utah which was started in 1950. This survey was supplemented by ground counts on State refuges, along aerial transect routes.

2. Weather conditions during the spring of 1951 were not good, especially during March when there were blizzards and the marshes were frozen over. This delayed the nesting of geese and was severe enough to kill shore birds which had migrated into the area. Heavy floods scattered the birds over vast areas of flooded ground but did not flood nests as the birds were forced to high ground before the nesting season started. The late spring weather was ideal for the hatching and brooding of ducks.

3. The aerial census of 1952 covered 289 linear miles or 72.1 square miles. A total of 3,865 ducks were counted on these flights, or an average of 53.6 birds per square mile. This was a decrease of approximately 30.0 percent from the 1951 counts. This was probably not a decrease but a scattering of the birds over more flooded ground. Counts on State refuges showed an increase for all species except the Canada goose.

4. Redheads were the most prominent species noted on the aerial census routes (37.9 percent). Other important species were cinnamon teal (25.0 percent), mallard (9.0 percent), and gadwall (8.6 percent). These counts do not accurately represent the breeding ground population for northern Utah as most of the counts were made on open water where redheads could be easily counted. Many of the upland nesters, such as pintail and mallard were already nesting and scattered throughout the farming sections where they could not be counted.

WATERFOWL BREEDING GROUND SURVEY IN MONTANA

Wynn G. Freeman and Gerald Salinas

This report covers the fourth State-wide breeding ground survey made by Montana State Fish and Game Department personnel. These surveys are conducted as a contribution to continental waterfowl management.

The 1952 survey was divided into two phases: The aerial survey to determine population and water area trends and the ground surveys to establish species composition and nesting success.

The aerial survey was conducted by Don Brown (pilot) and Wynn Freeman (observer), both of the Fish and Game Department. The ground survey was conducted by Gerald Salinas, Dan Poole and Richard Smith of the Fish and Game Department, and LeRoy Ellig, student assistant. The U. S. Fish and Wildlife Refuge managers throughout the State made brood counts and submitted population information. Total brood counts on Medicine Lake Refuge were made by Vernon Hawley.

Climatic Conditions

The early spring runoff and dry mild weather throughout the nesting season resulted in excellent conditions for waterfowl production. Severe flood conditions prevailed throughout the northern Highline country during late March and early April. This condition, however, filled potholes and reservoirs which had remained dry during most of the past two years. The newly created areas were available to nesting birds by the time they were needed. The exception to the State-wide situation of improved water conditions was the Highline area east of Glasgow. This area showed 23 percent fewer water areas in 1952 than were observed in 1951.

Based upon the rate of vegetative development and the appearance of appreciable numbers of early broods, the 1952 spring season was advanced one week or more in most of Montana. The severe storms which have been occurring in early June during the past three years failed to materialize this year.

Methods

The geological subdivisions of Montana as described in "Waterfowl Breeding Conditions in Montana" (Crissey and others 1/) were used as the basis for the surveys. Both transects and trend areas were used to determine the status of water areas and the population numbers. The survey was begun as soon as it was determined that the spring migration was nearing completion.

1/ Crissey and Others, "Waterfowl Populations and Breeding Conditions - Summer 1949," Special Scientific Report: Wildlife No. 2, pp. 123-135.

Results

The same transects and trend areas have been censused since 1949. (See Crissey and Others op. cit.) The comparative results of the 1951 and 1952 aerial censuses are shown in Table 1.

All three major subdivisions of the State showed an increase in the number of breeding birds over 1951. However, the section of the Northern Glaciated Prairie which lies east of Glasgow showed a decrease in the number of water areas available for nesting birds (Table II). Both the Eastern and Sheridan Moraine of the Northern Glaciated Prairie are in this section.

The central Highline, an area of early spring floods, showed an increase in breeding population of 25.98 percent. This area also had an increase in water areas amounting to 20.3 percent. Bowdoin National Wildlife Refuge and several easement areas are located in this section. Leon Snyder, Refuge Manager, had this to say regarding these areas (personal correspondence), "Our easement refuges in Hill, Blaine and Phillips Counties all overflowed their spillways, some of them for the first time since the establishment of the areas as refuges. Lake Thibideau in northern Montana, entirely dry for the past 17 years, obtained a 12-foot water depth." Further, "On the whole, the writer feels that the spring migration was above normal and a far greater than usual number of ducks remained to nest in the general area."

The southern Unglaciated Prairie Region is the largest habitat unit in the State. Stock water reservoirs constitute the bulk of the available water. The waterfowl density in this region is normally low. However, the trend areas in this region showed a greater percentage increase in breeding birds than any of the other regions (Table I). In addition, the number of water areas on two of the trend areas was increased by 20 percent through the construction of new dams and the filling of areas that have been dry.

The trend areas in the mountainous region showed a 13 percent increase over the 1951 breeding density.

Grover Elgan, Refuge Manager for Ninepipes and Pablo Wildlife Refuges in the mountain area says, "There seems to be an increase in the number of breeding waterfowl this year."

Winston Banko, Refuge Manager of Red Rock Lakes, said about their breeding population, "Waterfowl breeding populations are roughly equal to, or slightly greater than was present last year."

The species composition of the breeding waterfowl population was determined for five trend areas (Table III). There were notable changes in the percentage of species composition of each area.

There was a very apparent increase of pintails throughout the northern prairie area. All trend areas showed a decrease in the percentage composition of shovelers and blue-winged teal. This trend is shown by figures from Bowdoin, Medicine Lake Refuge and Freezout Lake (Table III). Redheads also showed a trend towards increase in this area. A large percentage increase of scaups and a

Table I - Comparative Information on the Montana Waterfowl Breeding Ground Census of 1951 and 1952

Area	Sq. Mi. Sampled	Ducks per Sq. Mi.	Approx. Size of Sample Area	Population Estimate	Percent Change
Northern Glaciated Prairie					+10.73*
Eastern					
1951	158.5	4.35	7,920	34,452	- 5.6
1952	158.5	4.12		32,630	
Central					
1951	132.75	10.16	9,468	96,195	+25.98
1952	124.25	12.80		121,190	
Sheridan Morraine					
1951	48	22.79	1,440	32,818	- 6.4
1952	48	21.35		30,744	
Great Falls Piedmont					
1951	142.75	4.43	7,020	31,098	- 1.1
1952	137.75	4.38		30,748	
Southern Unglaciated Prairie					
Trend Areas					
1951	599	0.71			+52.0
1952	599	1.08			
Mountainous Area					
Trend Areas					
1951	14.25	28.1			+13.0
1952	14.25	31.8			

*Weighted percentage increase.

Table II - Comparative Numbers of Water Areas as Determined from Aerial Transects

Area	Approx. Area (Sq. Mi.)	Water Areas Per Sq. Mi.		Percentage Potholes		Percentage Reservoirs		Total Water Areas		Percent Change
		1951	1952	1951	1952	1951	1952	1951	1952	
East Highline	7,920	1.4	1.1	75.9	73.7	24.1	26.3	11,088	8,712	- 21.4
Center Highline	9,468	2.0	2.4	62.6	68.0	37.4	32.0	18,936	22,723	+ 20.3
West Highline (Great Falls Piedmont)	7,020	2.3	2.5	72.4	68.0	27.6	32.0	16,146	17,550	+ 9.3
Total								46,170	48,985	

Table III - Waterfowl Species Composition of Breeding Ducks for Five Trend Areas in Montana - 1951 and 1952

Species	Percent of species composition: Brown's Lake** Trend Area		Medicine Lake* Wildlife Refuge		Bowdoin*** Wildlife Refuge		Freezout Lake*		Flathead Valley** Trend Area	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Mallard	19.5	39.8	14.3	16.8	26.4	17.8	4.5	3.6	19.1	16.0
Pintail	4.6	4.4	10.1	15.9	11.2	28.7	32.4	28.8	0.3	0.0
Baldpate	29.7	13.8	4.7	3.6	6.8	5.7	1.1	1.5	0.7	2.3
Shoveler	2.3	2.7	11.0	6.4	13.4	6.4	3.4	1.8	4.2	3.1
Gadwall	4.6	7.2	20.6	21.2	9.0	6.4	28.7	32.4	3.5	1.5
Scaup	14.1	6.6	1.7	6.1	1.1	1.9	11.0	21.6	3.8	1.6
Coot	0.0	0.0	9.0	4.1	4.7	4.5	0.0	0.0	24.4	24.4
Ruddy	1.2	0.0	4.4	3.7	2.0	5.1	4.7	0.8	3.8	1.0
Canvasback	0.0	0.0	5.6	3.2	2.2	2.5	1.4	1.0	0.0	0.0
Blue-winged teal	5.2	11.6	15.2	13.0	20.4	15.9	7.6	4.9	8.3	6.1
Redhead	3.5	5.2	3.2	5.0	2.2	5.1	4.7	3.1	29.5	43.2
G-w. teal	0.0	3.8	0.2	0.7	0.6	0.0	0.0	0.5	0.3	0.8
Goldeneye	5.2	4.9	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Cinn. teal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
Bufflehead	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Based on numbers of broods counted for each species.

** Based on census of breeding ducks.

*** Based on estimated breakdown of total breeding population.

Table IV - Waterfowl Broods by Size and Age Classes - Montana

Species	Average Brood Size Medicine Lake		Av. Class III Broods Eastern Montana Trend		Average Brood Size Freezout Lake	
	1951	1952	1951	1952	1951	1952
Mallard	4.40	5.69	5.3	5.7	6.6	7.0
Gadwall	7.25	6.35	-	-	7.2	7.9
Baldpate	5.47	5.29	5.6	4.0	-	-
Pintail	4.69	6.16	3.5	6.7	4.6	6.4
G-w. teal	4.25	4.00	4.8	5.0	-	-
B-w. teal	6.79	5.77	7.1	7.8	6.6	8.0
Shoveler	5.27	5.15	-	-	-	-
Redhead	6.18	5.40	-	-	-	-
Canvasback	7.26	5.90	-	-	-	-
Scaup	7.35	5.51	-	-	7.0	9.0
Ruddy duck	5.30	4.59	-	-	-	-
Coot	2.00	3.53	-	-	-	-

decrease in shovelers and blue-winged teal was noticeable at Freezout Lake. This was the second consecutive year that pintail have shown definite increases in this area.

The Brown's Lake trend area in the mountainous region showed a large percentage increase for both mallards and blue-winged teal. It showed a decrease for scaup and baldpate. The major change in the Flathead trend area of the same region was a considerable increase in redheads (Table III).

Weather and water conditions combined to make an ideal waterfowl production year. Even in the Sheridan Moraine area where both fewer waterfowl and fewer water areas were counted in the spring, production was equal to that of 1951. For example, Refuge Manager Adams at Medicine Lake Refuge says "Throughout the summer there has been a shortage of refuge ducks in comparison with the 1951 figures, amounting to about 25 percent. . . Based on actual counts of broods of young birds, we feel that the total waterfowl production on the refuge is almost as great as last year."

In the Freezout Lake area, average brood sizes of gadwall, pintail, mallard and lesser scaup were all above those of 1951. Pintails showed the greatest increase from 4.6 ducklings per brood in 1951 to 6.4 in 1952. The broods observed for other species in this area were insufficient to be conclusive. Other areas throughout the northern prairie area showed increases in brood size (Table IV).

The average size of Class III broods in the eastern Montana trend areas for all species was 6.4 birds or 1.3 birds per brood larger than 1951. The average size was 4.0 birds per brood larger than the 1950 figure.

Winston Banko, Refuge Manager at Red Rock Lakes, estimated a production increase of 15 percent over 1951, and indicated an unusual abundance of coot broods.

The increased production of pintails was most notable throughout the northern prairie area of the State. There were definite percentage increases in the breeding population within this prairie area. In addition, all brood counts showed large increases in the average brood size of pintails (Table IV).

Summary

1. Weather conditions were considered to be ideal for nesting waterfowl.

2. Water conditions were satisfactory. There was a considerable increase in numbers of water areas in the central and western portions of the glaciated region. Permanent type areas were full at the start of the season. However, temporary and intermediate type waters were scarce in the eastern glaciated prairie region.

3. There was a 10.73 percent increase in the number of breeding birds observed in the northern Glaciated Prairie region.

4. There was a 52 percent increase in the number of birds observed on the trend areas in the southern unglaciated prairie region. This is an area of low waterfowl density and consequently small variations in numbers will cause a large variation in percentage changes.

5. There was a 13 percent increase in the number of birds observed in the trend areas in the mountainous region.

6. Species composition changes were noted in all trend areas. An increase in the percentage composition of pintails and a decrease in shovelers and blue-winged teal was especially noticeable in the northern glaciated prairie region.

7. Production has increased with more and larger average-sized broods being observed over the same census routes.

WATERFOWL BREEDING GROUND SURVEY IN COLORADO

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Introduction

In Colorado, waterfowl breeding grounds are logically divided into river-bottom and irrigated land on the East Slope, and vast areas of mountain parks, valleys, lakes, and beaver-ponds west of the Continental Divide.

Colorado breeding ground studies in 1952 include three areas covered in 1951, and three new areas added this year in northwest Colorado. Comparative data for 1951 and 1952 are therefore available for the irrigated land type in northeast Colorado, for North Park, and for the San Luis Valley. New areas included in 1952 studies are the Yampa River Valley, Brown's Park, and high-country lakes and beaver dams on the White River plateau. It is hoped that coverage in 1953 can be extended to include South Park, the Gunnison-Grand Mesa region, and the San Juan Mountains, thus completing the survey of important waterfowl breeding grounds in the State.

Methods and Sample Areas

Survey methods used in 1951 were retained in 1952, except where physiography and size of area necessitated modifications. Thus, the general procedure was determination of the breeding population and, later, production, chiefly by breeding-pair and brood counts, on selected samples for all breeding grounds surveyed. The data so obtained has been used in estimating total production, and thus the indicated size, of the 1952 waterfowl crop.

One variation in this technique, confined to the northeast Colorado and North Park samples, involved the correlation of aerial counts of breeding birds and broods with ground observations. This phase of study was initiated in 1951 and is designed to perfect a reliable means for surveying breeding grounds by aircraft. Results from this two-year comparison of methods will be found in another report.

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A summary of sampling methods and areas is given in Table I.

Table I - Waterfowl Breeding Areas and Samples, Colorado - 1952

Breeding Grounds	AREA			Sampling Method *
	Total Sq. Mi.	Sample Sq. Mi.	Percent of Total	
Northeast Colorado				
Cache la Poudre Valley	36	36	100	Ground and Aerial
South Platte Valley	1,407	-	-	Aerial
North Park	815	30	3.6	Ground and Aerial
San Luis Valley	-	-	-	Aerial
Yampa River Valley	220	22	10.0	Ground
Brown's Park	15	15	100.0	Ground and Aerial
White River Plateau	360	18	5.0	Ground

* Breeding pairs, lone birds, and broods recorded by species and by cover types in both ground and aerial coverages. Vehicle employed for ground travel; inaccessible areas walked. Cessna 140 and Cessna 170 planes used for aerial work, crew consisting of pilot and observer. Identical forms used for recording data in both forms of coverage.

Weather and Water Conditions

Climatological data and phenological records indicate that the 1952 spring season in Colorado was about 10 days earlier than in 1951. This circumstance apparently resulted in earlier northward migration and probably earlier nesting than in the preceding year.

The earlier season, however, appears to have been counter-balanced by flooding losses caused by unprecedentedly heavy runoff, which adversely affected both east and west slope streams. Along the Yampa River especially such losses were heavy; and apparently heavier than normal spring flooding was common throughout the State. It now appears that flooding losses were largely compensated for by renesting.

Except for flooding and a three-week drought in northeast Colorado, weather conditions have been generally favorable to waterfowl nesting. Water levels in practically all lakes, reservoirs, and marshes are higher than normal, the only loss from this source being due to the drying up of shallow depressions in the northeastern part of the State, which ordinarily are too dry for nesting purposes.

Discussion of Data

For convenience the six breeding grounds considered in this report will be treated separately and in summary form.

Northeast Colorado

As in preceding years, the approach in northeast Colorado was both intensive and extensive. On a sample township (T7N, R68W) in the Cache la Poudre Valley, all waterfowl habitats were covered by foot at bi-weekly intervals during the breeding season and a good estimate of total production determined. The South Platte Valley was studied extensively, wherein an aerial trend route was covered three times during the season.

The information collected in 1952 for these breeding areas is presented in Tables II to VII, inclusive.

Cache la Poudre Valley - A comparison of the total territories on the Cache la Poudre study area in 1951 and 1952 shows that for all species there was 17.5 percent decrease in nesting-pair numbers this year (Table II). The percent of change given by species in this table is valid for only the mallard and blue-winged teal (the only two important ducks) because of the sample size involved.

Table II - Waterfowl Density by Species, Cache la Poudre Valley, 1951 and 1952

Species	1951		1952		Percent Change 1951 to 1952
	Number	Pairs Per Sq. Mile	Number	Pairs Per Sq. Mile	
Mallard	103	2.86	82	2.28	- 20.4
B-w. Teal	21	0.58	17	0.47	- 19.0
Cinnamon Teal	1	0.03	5	0.14	+ 400.0
Gadwall	6	0.17	4	0.11	- 33.3
Total	131	3.64	108	3.00	- 17.5

Examination of Table III reveals that only two types (sloughs and rivers) showed an increase in breeding-pair numbers in 1952. All other types decreased from 22 to 66 percent as compared to last year. The slough and river increase is believed to have been caused by the early nesting season which forced the birds to choose areas with residual cover such as that found on the types involved; no other cover was available at the beginning of the nesting season this year.

Production figures for the study area reveal that, despite a breeding-pair deficiency in 1952, final production of 14 birds per square mile compares favorably with 13 birds in 1950 and 14 birds in 1951 (Table IV). Species composition remained the same, mallards being by far the most important and blue-winged teals second. Eight other species were observed during the three years but, even in the aggregate, they represent only a small fraction of the total production. The uniformity exhibited in total production during the three-year period is striking and probably significant.

Table III - Total Territories by Habitat Type and Species, Cache la Poudre Valley

Habitat Type	Species	1951	1952	Percent Change
Large Lakes	Mallard	17	12	- 29.4
	Blue-winged teal	3	5	+ 66.6
	Gadwall	6	4	- 33.3
	Cinnamon teal	1	0	- 100.0
	Total and Average	27	21	- 22.2
Small Lakes and Ponds	Mallard	12	5	- 58.3
	Blue-winged teal	4	1	- 75.0
	Cinnamon teal	1	1	-
	Total and Average	17	7	- 58.8
Sloughs	Mallard	8	8	00.0
	Blue-winged teal	4	8	+ 100.0
	Cinnamon teal	0	3	+ 300.0
	Total and Average	12	19	+ 58.3
River	Mallard	12	22	+ 83.3
	Blue-winged teal	2	-	- 200.0
	Total and Average	14	22	+ 57.1
Creeks and Drain Ditches	Mallard	16	11	- 31.2
	Blue-winged teal	4	3	- 25.0
	Cinnamon teal	0	1	+ 100.0
	Total and Average	20	15	- 25.0
Irrigation Ditches	Mallard	16	6	- 62.5
	Blue-winged teal	2	0	- 200.0
	Total and Average	18	6	- 66.6
Irrigation Canals	Mallard	22	18	- 18.2
	Blue-winged teal	2	0	- 200.0
	Total and Average	24	18	- 25.0
Grand Total		131	108	- 17.5

Table IV - Waterfowl Broods by Species on the Cache la Poudre Valley Study Area, Township 7 N, Range 68 West

Species	BROODS OBSERVED														
	Number Broods			Percent Total Number Broods			No. of Young			Av. No. Young			Production Per Square Mile		
	1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952
Mallard	62	52	54	76.6	63.5	65.9	363	305	347	5.85	5.86	6.43	10.08	8.48	9.64
Blue-winged teal	13	25	18	16.1	30.5	22.0	79	165	108	6.08	6.60	6.00	2.19	4.60	3.00
Cinnamon teal	-	1	-	-	1.2	-	-	9	-	-	9.00	-	-	0.25	-
Green-winged teal	-	1	-	-	1.2	-	-	6	-	-	6.00	-	-	0.16	-
Lesser scaup	-	1	-	-	1.2	-	-	6	-	-	6.00	-	-	0.16	-
Redhead	1	1	-	1.2	1.2	-	3	11	-	3.00	11.00	-	0.08	0.30	-
Gadwall	1	-	-	1.2	-	-	8	-	-	8.00	-	-	0.22	-	-
Pintail	1	-	1	1.2	-	1.2	6	-	5	6.00	-	5.00	0.18	-	0.14
Baldpate	-	-	1	-	-	1.2	-	-	9	-	-	9.00	-	-	0.25
Ruddy duck	-	-	2	-	-	2.4	-	-	7	-	-	3.50	-	-	0.19
Unidentified	3	1	6	3.7	1.2	7.3	7	6	33	2.33	6.00	5.50	0.19	0.16	0.92
Total	81	82	82	100	100	100	466	508	509	5.75	6.20	6.29	12.95	14.11	14.14

Table V - Waterfowl Broods by Cover Types on Township 7 N, Range 68 West, Colorado - 1950, 1951 and 1952

Type	NUMBER BROODS OBSERVED														
	Number Broods			Percent Total Number Broods			No. of Young			Av. No. Young Per Brood			Production Per Square Mile		
	1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952	1950	1951	1952
Lakes and Reservoirs	27	52	42	33.3	63.5	51.2	162	328	253	6.00	6.31	6.02	4.50	9.11	7.02
Sloughs and Marshes	11	12	10	13.6	14.6	12.2	66	78	63	6.00	6.50	6.30	1.83	2.17	1.75
Irrigation Canals	16	8	10	19.7	9.8	12.2	95	51	71	5.31	6.38	7.10	2.64	1.42	1.97
Irrigation Ditches	14	3	3	17.3	3.6	3.6	59	14	19	4.21	4.67	6.33	1.46	0.39	0.53
River	9	4	15	11.1	4.9	18.3	60	19	95	6.66	4.75	6.33	1.67	0.52	2.64
Creeks and Drains	4	3	2	5.0	3.6	2.5	28	18	8	6.00	6.00	4.00	0.67	0.50	0.23
Total	81	82	82	100	100	100	466	508	509	5.75	6.20	6.21	12.95	14.11	14.14

Table VI - Comparison of Aerial Waterfowl Breeding-Pair Counts, South Platte River - 1951 and 1952

Species	Pairs		Lone Males		Total Pairs		Total Pairs Per Mile Including Lone Males	
	1951	1952	1951	1952	1951	1952	1951	1952
Area I -- 41 Miles, Derby to Greeley								
Mallard	53	7	16	23	69	30	1.68	.73
Teal	5	1	0	0	5	1	.12	.02
Gadwall	7	1	0	0	7	1	.17	.02
Pintail	2	0	0	1	2	1	.05	.02
Total	67	9	16	24	83	33	2.02	.79
Area II -- 52 Miles, Greeley to Fort Morgan								
Mallard	69	10	31	12	100	22	1.92	.42
Teal	26	3	1	0	27	3	.52	.08
Gadwall	26	2	1	0	27	2	.52	.05
Pintail	0	1	0	0	0	1	0.00	.02
Total	121	16	33	12	154	28	2.96	.57
Area III -- 43 Miles, Fort Morgan to Sterling								
Mallard	34	12	6	17	40	29	.93	.67
Teal	16	2	1	1	17	3	.39	.07
Gadwall	6	2	2	0	8	2	.19	.05
Total	56	16	9	18	65	34	1.51	.79
Area IV -- 68 Miles, Sterling to Julesburg*								
Mallard		20		27		47		.69
Teal		10		3		13		.19
Gadwall		6		3		9		.13
Baldpate		1		0		1		.02
Total		37		33		70		1.03

* Area IV was not flown in 1951 due to high winds and severe turbulence.

Evaluation of production by cover types shows that many more broods were produced on the river in 1952 (Table V). This corresponds to the findings of the breeding-pair survey. Although breeding-pairs were increased on the slough type, production was not greater this year, probably because of a severe hailstorm which filled sloughs and destroyed nests.

When considered over the three-year period, sizable water bodies such as lakes and reservoirs were most important with canals and sloughs ranking second in production per square mile. Irrigation ditches and the Cache la Poudre River were fairly important as nesting sites during 1950 and 1952, but relatively unimportant in 1951.

Final calculations reveal that 75.9 percent of the breeding pairs successfully produced broods in 1952. This success ratio was much higher than in 1951 when only 62.6 percent of the breeding-pairs were successful. No comparative data are available for 1950.

South Platte Valley - Due to insufficient time and manpower it was impossible to cover the South Platte study sections as in past years. Rather, all information presented here is based on aerial trend counts for 1951 and 1952. This two-year summary is tabulated in Table V I, and reveals that breeding-pair numbers in 1952 were fewer than in 1951. The comparison, however, is affected by two major uncontrollable factors. In 1951, the water level of the South Platte River was low as compared to 1952; secondly, nesting season in 1952 was advanced by about 10 days. These facts alone would partially account for the high number of ducks seen in 1951 because migration was probably still in progress on the date of the plane coverage.

Aerial brood counts in 1951 and 1952 show that the earlier 1952 enumeration was much less than 1951. A later count gave totals very similar to those of 1951; however, it is doubtful whether either of the 1952 flights were comparable to 1951 because of phenological differences between the two years.

General observations in the South Platte Valley tend to clarify the results of the aerial surveys. Without question there were fewer breeding-pairs in the Valley this year; however, it is believed that the excellent nesting and brood-rearing season permitted final production figures to approach those of 1951.

Table V I I - Aerial Brood Counts, South Platte River, 1951 and 1952

Area	No. of Broods			No. of Young			Av. No. Yg./Brood		
	1951	1952		1951	1952		1951	1952	
	Mid-July	Mid-July	Early Aug.	Mid-July	Mid-July	Early Aug.	Mid-July	Mid-July	Early Aug.
Denver - Greeley	4	3	2	19	9	9	4.8	3.0	4.5
Greeley-Ft. Morgan	4	2	10	14	13	47	3.5	6.5	4.7
Ft. Morgan-Sterling	7	4	4	24	20	20	2.8	5.0	5.0
Sterling-Julesburg	16	12	15	91	53	82	5.7	4.4	5.5
Total	31	21	31	148	95	159	4.8	4.5	5.1

North Park - Eight sample areas in the important North Park region were covered in 1952 for the second consecutive year. Comparisons for the two years are given in Tables VII I and IX.

On the basis of comparable counts on eight areas, the 1952 breeding-duck population was about 15 percent higher than in 1951 (Table VIII). Final production figures correspond directly to this breeding-pair trend count, with an increase of 13 percent in the number of broods, and 15 percent in young in 1952 (Table IX).

The increase in production is attributed to a larger number of mallards, green-winged teals, canvasbacks, and lesser scaups successfully bringing-off broods this year. Baldpates, shovelers, redheads, and ruddy ducks were down somewhat in production from 1951; and other species remained about the same during the two-year period. Considering both years, baldpates and mallards produced better than 50 percent of the total North Park broods.

Table VIII - Observed Breeding Duck Populations on Eight Study Areas in North Park

Species	Pairs		Lone Males		Males		Females		Totals	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Mallard	13	12	2	21	54	124	1	1	83	170
Gadwall	93	58	-	2	5	5	-	-	191	123
Baldpate	31	17	1	5	12	17	-	-	75	56
Pintail	4	7	-	1	12	11	-	2	20	28
Green-winged teal	-	6	1	4	-	2	-	1	1	13
Blue-winged teal	1	4	-	-	-	-	-	-	2	8
Cinnamon teal	3	4	4	3	1	7	-	-	11	18
Shoveler	5	5	-	-	12	2	3	1	25	15
Redhead	19	12	-	-	17	29	5	2	60	55
Lesser scaup	22	33	2	-	5	23	1	1	52	90
Canvasback	-	1	-	1	6	4	1	-	7	7
Ring-necked duck	-	-	-	-	-	1	-	-	-	1
Ruddy duck	2	4	-	-	6	28	4	10	14	42
Total	193	163	10	37	130	253	15	18	541	626

Table IX - Waterfowl Brood Counts by Species, North Park Study Areas, Colorado -- 1951 and 1952

Species	Class I			Class II			Class III			Totals		
	Brds.	Yg.	Av.	Brds.	Yg.	Av.	Brds.	Yg.	Av.	Broods	Young	Average
BROODS OBSERVED - 1951												
Mallard	80	502	6.3	26	174	6.7	42	264	6.3	148	940	6.4
Gadwall	49	368	7.5	13	97	7.5	6	29	4.8	68	494	7.3
Baldpate	141	924	6.6	39	240	6.2	35	233	6.7	215	1,397	6.5
Pintail	21	105	5.0	9	46	5.1	13	64	4.9	43	215	5.0
Green-winged teal	9	54	6.0	3	21	7.0	7	41	5.9	19	116	6.1
B-w. & Cinn. teal	3	28	9.3	-	-	-	3	13	4.3	6	41	6.8
Shoveler	9	61	6.8	2	14	7.0	4	28	7.0	15	103	6.9
Redhead	25	187	7.5	1	8	8.0	5	26	5.2	31	221	7.1
Canvasback	2	14	7.0	-	-	-	2	11	5.5	4	25	8.8
Lesser scaup	25	220	8.8	10	86	8.6	6	43	7.2	41	349	8.5
Ruddy duck	6	37	6.2	-	-	-	6	42	7.0	12	79	6.6
American merganser	-	-	-	-	-	-	1	3	3.0	1	3	3.0
Unidentified	10	54	5.4	5	20	4.0	1	6	6.0	16	80	5.0
Total	380	2,554	6.7	108	706	6.5	131	803	6.1	619	4,063	6.6
BROODS OBSERVED - 1952												
Mallard	83	548	6.6	33	215	6.5	51	322	6.3	167	1,085	6.5
Gadwall	47	298	6.3	16	100	6.3	5	28	5.6	68	426	6.3
Baldpate	17	772	6.6	29	201	6.9	34	233	6.9	180	1,206	6.7
Pintail	15	88	5.9	10	65	6.5	26	147	5.7	51	300	5.9
Green-winged teal	24	159	6.6	6	35	5.8	13	78	6.0	43	272	6.3
B-w. & Cinn. teal	1	8	8.0	-	-	-	1	2	2.0	2	10	5.0
Shoveler	2	5	2.5	2	12	6.0	2	12	6.0	6	29	4.8
Redhead	8	51	6.4	6	57	9.5	9	62	6.9	23	170	7.4
Canvasback	11	83	7.5	5	34	6.8	4	30	7.5	20	147	7.4
Lesser scaup	40	302	7.6	17	140	8.2	10	76	7.6	67	518	7.7
Ruddy duck	2	13	6.5	-	-	-	1	7	7.0	3	20	6.7
Unidentified	35	230	6.6	14	98	7.0	23	171	7.4	72	499	6.9
Total	385	2,557	6.6	138	957	6.9	179	1,168	6.5	702	4,682	6.7

San Luis Valley - In general, the San Luis Valley water levels in 1952 were above those of previous years because of high winter precipitation on drainages entering the valley. This resulted in increased nesting habitat and consequently a greater dispersion of nesting-pairs.

Results of the 1952 aerial survey is given in summary form in Table X. No measured data are available for the 1951 count; however, the 1949 and 1950 results are offered for comparison. The 1952 aerial survey confirmed previous predictions that production would show an increase this year. Not only were more broods produced, but significantly more young were found per brood than in former years. Thus the production of young was increased by about 35 percent over 1950.

In a comparison of 1951 and 1952 production, the habitat restrictions imposed on the breeding population by the 1951 drought limited nesting to the permanent water areas. Beyond a doubt, the unrestricted nesting in 1952 permitted a much larger production than in 1951.

Table X - Comparison of Production in the San Luis Valley, 1949, 1950 and 1952

Year	Number of Broods	Number of Young	Average Number of Young per Brood
1949	57	353	6.20
1950	100	522	5.22
1952	115	809	7.03

Yampa River Valley - The Yampa Valley is a long narrow floodplain and canyon extending from the headwaters of this stream on the White River Plateau to its confluence with the Green River in northwest Colorado. The Valley varies from 1/8-mile in width in the canyons to about 10 miles in width shortly after its emergence on to the floodplain proper west of Steamboat Springs. The water table along the entire non-canyon portion of the Valley is high, and development of sedge and cattail marsh is extensive. This habitat, plus the oxbow and meandering stream areas, constitutes the waterfowl breeding grounds found in the region.

Studies in the Yampa River area were begun in April 1952. Sampling was on the basis of 11 2-mile strips at 20-mile intervals, along the 220 mile length of the stream. Each strip was 1 mile wide. Observations of adult ducks and broods were recorded bi-weekly. Complete data now available for this breeding ground are presented in Table XI.

On this 22-square mile sample, constituting 10 percent of the Valley area, a breeding-pair density of 8.7 per square mile was recorded. Brood density was 6.4 per square mile, giving 1.36 pairs of birds per brood for the sample area. Production expressed in number of young produced per square mile was 40.26. Projection of these figures reveals that the Yampa Valley produced about 9,000 ducks and geese in 1952.

Table XI - Observed Waterfowl Pairs and Broods on 22-Square Miles in the Yampa River Valley, September 5, 1952*

Species	Pairs	Percent of Total	Number of Broods	Percent of Total	Number of Young	Average Number per Brood
Mallard	105	54.98	93	66.43	611	6.57
Blue-winged or Cinn. teal	27	14.14	17	12.14	87	5.14
Green-winged teal	24	12.57	14	10.00	77	5.50
Pintail	4	2.09	2	1.43	11	5.50
Gadwall	4	2.09	-	-	-	-
Shoveler	3	1.57	-	-	-	-
American merganser	12	6.28	8	5.71	67	8.32
Canada geese	12	6.28	4	2.86	14	3.40
Unidentified	-	-	2	1.43	14	7.00
Total	191	100.00	140	100.00	881	6.29

* Duplicate broods eliminated.

Breeding-pair Density Per Square Mile 8.7

Brood Density Per Square Mile 6.4 = 1.36 Pairs of Birds Per Brood

Production Per Square Mile 40.26

Brown's Park - This is primarily a heavily grazed, sagebush-covered mountain park, bisected by the Green River. It is located in extreme northwest Colorado, and both the park and the river extend into the adjoining State of Utah. Waterfowl habitat in Colorado is limited to the floodplain area along a 15-mile stretch of the river. Since this bottomland averages about 1 mile wide, available waterfowl nesting ground consists of approximately 15 square miles. The entire bottomland portion was included in the survey. Cattail and bulrush marsh, flooded hay meadows, and willow-bordered stream banks characterize the waterfowl habitat found in this region.

Studies in Brown's Park were begun in April 1952 and the last brood counts were made late in August. Results are given in Table XII.

On this 15-square mile sample, constituting 100 percent of the waterfowl nesting ground in the Colorado portion of Brown's Park, the breeding-pair density was 19.6 per square mile. Brood density was 13.8 per square mile, giving 1.4 pairs of birds per brood for the area. Production, expressed in number of young produced per square mile, was 96.7. The indicated production for the entire park was 1,451 young.

Table XII - Observed Waterfowl Pairs and Broods - Brown's Park, 1952 *

Species	Breeding Pairs	Percent of Total	No. of Broods	Percent of Total	No. of Young	Average No. Per Brood
Canada geese	21	7.1	12	4.1	60	5.0
Mallard	113	38.4	90	45.6	662	7.4
Pintail	14	4.8	10	4.6	66	6.6
Gadwall	60	20.4	9	3.7	55	6.1
Shoveler	7	2.4	1	0.1	1	1.0
Teals	40	13.6	37	19.5	283	7.6
Redhead	34	11.5	18	9.0	131	7.2
Ruddy duck	5 **	1.8	7	2.6	37	5.3
Unidentified	0	-	23	10.8	156	6.8
Total	294	100.0	207	100.0	1,451	7.0

* Duplicate broods eliminated.

* * Apparently all Ruddy duck breeding-pairs were not observed during the period of breeding-pair counts.

High-Country Lakes and Beaver Ponds - This phase of the Colorado waterfowl breeding ground survey was initiated about mid-June 1952. Weekly breeding population and brood counts were conducted from that time until early in September.

The study area for this type is confined to high-mountain lakes and beaver ponds in the spruce-fir zone above 9,000 feet elevation. Approximately 20 small lakes and several miles of stream were included in the 18-square mile sample.

This investigation has shown that small lakes bordered by sedges and willows were by far the most productive. Very few ducks were found to nest on the beaver ponds, a possible result of damages by an unusually heavy runoff. Repair by beavers was relatively recent, resulting in the creation of ponds not present at the beginning of the duck-nesting season.

Mallards and green-winged teals were the only nesting species on the study area (Table XII I). Mallards were most abundant with about 25 pairs present. Five pairs of green-winged teal were seen on the sample area. These data indicate a breeding-pair density of 1.6 per square mile of study area.

Final brood counts revealed that 75.9 percent of the breeding population successfully produced broods. This resulted in a production of 6.8 young per square mile.

Table XIII - Observed Waterfowl Pairs and Broods on 18 Square Miles of the White River Plateau - 1952

Species	Breeding Pairs	Percent of Total	No. of Broods	Percent of Total	No. of Young	Av. No. per Brd.	Production per Sq. Mile
Mallard	24	82.76	19	86.36	102	5.4	5.7
Green-winged teal	5	17.24	3	13.64	20	6.7	1.1
Total	29	100.00	22	100.00	122	5.5	6.8

On the basis of this 5 percent sample it appears that nearly 2,500 ducks were produced on the 360 square miles of comparable type on the White River Plateau.

Summary

1. Studies were made on six waterfowl breeding grounds in Colorado in 1952, including three areas covered in 1951. Comparable data for 1951 and 1952 are thus available for the irrigated land type in northeastern Colorado, for North Park and for the San Luis Valley.

2. Three heretofore unstudied breeding grounds include the Yampa River Valley, Brown's Park, and the high-country lake and beaver-dam type found on the White River Plateau.

3. The 1952 breeding-pair population on irrigated land in the Cache la Poudre Valley was about 17 percent lower than for the preceding year. Excellent nesting and brood-rearing conditions, however, boosted final production to that of 1951.

4. Aerial surveys in 1952 on the South Platte River trend combined with a general field observation revealed a large decrease in breeding-pairs, but only a small decrease in final production from 1951.

5. Final 1952 North Park duck production was about 15 percent higher than in 1951.

6. San Luis Valley production in 1952 was much greater than in 1950. Gross comparison between 1951 and 1952 revealed that unrestricted breeding areas in 1952 allowed a greater production than did the restricted nesting habitat in 1951.

7. First-year studies in the Yampa Valley indicate that this is an important waterfowl breeding ground in Colorado. Mallards, teals, and Canada geese were the most common nesting species. Projection of sample area results revealed that about 9,000 ducks and geese were raised in the Valley this year.

8. First-year studies in Brown's Park revealed that an appreciable number of ducks and Canada geese nest along this portion of the Green River. The most important duck species were mallards, gadwalls, teals, redheads, and pintails. Indicated total Brown's Park production in 1952 was 1,451 ducks and geese.

9. Waterfowl production studies on high-country lakes and beaver dams show that production per square mile in the higher elevations is somewhat less than lower valley types. Mallards and green-winged teals were the only nesting species observed. On the basis of a 5 percent sample, the White River Plateau produced nearly 2,500 ducks this year.

10. The over-all outlook of the 1952 waterfowl crop in Colorado -- a season characterized by an abundance of water and damaging floods along streams -- compared favorably with that of 1951. A very small decrease in production on the East Slope was more than balanced by a striking increase in the San Luis Valley and North Park. No comparable data are available for other regions. Drought and hail accounted for minor losses in northeast Colorado.

COMPARISON OF AIR AND GROUND WATERFOWL COUNTS ON IRRIGATED LAND IN NORTH-CENTRAL COLORADO, 1951 and 1952

Jack R. Grieb *

Introduction

The use of aircraft in determining continental waterfowl breeding populations and production has become well established during the last few years. There is no question that such a census method is cheap and practical, especially where large areas need be covered and manpower is limited. In 1951, a cooperative study was initiated between the Colorado Game and Fish Department and the Colorado Cooperative Wildlife Research Unit for the purpose of determining the accuracy of such a census method and its adaptability to Colorado conditions. A further objective was to determine if correction factors could be evolved for use in aerial waterfowl counts on irrigated lands, so that aerial counts could be adjusted to give ground totals. This study was again carried on in 1952, and this report represents two years of intensive work on the subject. It is recognized that the results of this study would not be applicable to other areas except in principle.

Grateful acknowledgment is made to Dr. Lee E. Yeager, Leader, Colorado Cooperative Wildlife Research Unit, who originally conceived the idea of this study, and for help and advice throughout its course. Pilot Kenneth B. Milyard, Colorado Game and Fish Department, flew all flights in 1951. Ervin L. Boeker, Colorado Cooperative Wildlife Research Unit, assisted with both air and ground counts for the two years. Pilot Norman L. Hughes, Colorado Game and Fish Department flew all coverages in 1952.

Area

The Cache la Poudre study area is composed of Township 7 North, Range 68 West, 6th Principal Meridian, Colorado. This area contains a total of 65.5 miles of waterways in the following breakdown: irrigation canals, 25.9 miles; irrigation ditches, 12.0 miles; creeks and drain ditches, 20.2 miles; and river, 7.4 miles. There are 63.4 acres of sloughs and marshes, and 869.7 acres of irrigation reservoirs and natural lakes, both totalling 933.1 acres.

The area is divided by the Cache la Poudre River, which runs diagonally northwest to southeast. It is further drained by several streams emptying into the main river. Land-use consists of intensive agriculture. Most of the land is under irrigation, with only a small part of the more hilly portion farmed by dry-land practices.

Principal crop types consist of alfalfa, small grains, sugar beets and corn. Waste areas are few and scattered, and "clean farming" is practiced by most farmers. This involves burning of weeds along irrigation ditches, fence rows, and roadsides during late fall, winter, and early spring. The shortage of residue cover is met in part by early-growing alfalfa, grass and weeds. Table I lists and describes the types found on the study area.

* Colorado Game and Fish Department.

Table I - Description of Habitat Types Found on the Study Area

Habitat Type	Description
Large Lakes	Natural lakes or irrigation reservoirs, 300 surface acres or larger.
Small Lakes and Ponds	Lakes smaller than above, including small ponds or potholes.
Slough	Shallow water bodies containing emergent vegetation.
River	As normally defined.
Creek	As normally defined.
Irrigation Canals	Irrigation waterways over 8' wide, whose general function is to carry water long distances, mainly to irrigation reservoirs.
Irrigation Ditches	Irrigation waterways less than 8' wide, whose general function is to carry water to the fields.
Drain Ditches	Small waterways whose function is to carry underground water away from the fields.

Methods

Accurate comparison of air and ground breeding-pair counts depends a great deal on complete coordination between the air and ground teams. Because the Cache la Poudre study area is located centrally in the north-to-south migration path, a count of total breeding-pairs such as that taken further north would not reveal how many pairs would actually stay to nest on the area. It is necessary, therefore, to count only those pairs which have set up, or are attempting to set up territories. This means that only those pairs which are found by themselves and not in the company of other pairs, in addition to lone males or lone females, can be counted as representing a territory. Thus, training an aerial observer to recognize these things would be an important part of any technique which may evolve from this study.

Ground Surveys

The waterfowl breeding population on the township was determined by a series of counts initiated during the first part of April. All waterways on each section were walked and all water bodies scanned with a spotting scope at two-week intervals. Only those pairs which had apparently established territories were tallied and their location plotted on a map of the section. Sections were worked in similar order for each coverage.

Time of observation appears to be important, because farmers working in fields often flush birds from their chosen territories. For this reason work was confined to early morning hours (sunrise to about nine o'clock) and late afternoon (four o'clock to sunset).

Aerial Surveys

Aerial breeding-pair and brood counts were obtained by flying along each irrigation ditch or stream, and around each lake. Altitudes and speeds varied, but averaged around 100 feet and 60 miles per hour indicated air speed, respectively. During breeding-pair counts, ducks were recorded by habitat type, species, and, where possible, sex, thus permitting a closer evaluation of air and ground results. It was found impossible to obtain accurate species identification of broods from the air; therefore, only the number of young were recorded.

Two aircraft were used during the course of this problem. The first was a four-place Cessna 170, and the second a two-place Cessna 140. The alternate use of either craft did not seem to influence the number of birds counted, but it was noted that it was much easier to observe from the smaller plane because of structural differences.

Statistical Analysis

Covering the study area both on the ground and in the air permits comparison of the two counts. By dividing the ground count by the comparable air count, the air-to-ground ratio of the coverage can be established. The average ratio of several coverages may then be statistically tested by means of a contingency table and the chi-square test to determine whether the air-to-ground ratio was reasonably consistent between coverages. With a calculated chi-square value less than the tabular value of chi-square .5, it may be concluded that the average ratio is a good fit, and could be applied to future aerial counts to obtain an accurate estimate of the numbers actually on the ground.

Results

A total of five flights were made in 1951 and six in 1952 on the study area. The data thus derived emphasize the efficiency of aerial as compared with ground work. During spring counts it required roughly 35 man-hours to cover the study area adequately on the ground. By comparison, only one hour and 15 to 30 minutes flying time was needed for comparable aerial coverage. During the brood-counting season, after all ditches became filled with water, ground coverage time jumped to an average of about 86 man hours for the two years, and air time to slightly less than two hours.

Breeding-Pair Survey

Aerial breeding-pair counts in the Fort Collins area are best taken during late April, May and early June for it is during this time that most territories are still active. The total counts of territories for both 1951 and 1952 are tabulated in Table II. This table also lists the air-to-ground ratio for each coverage and gives the results of the chi-square test. Thus it was determined that average air-to-ground ratio found each year was consistent, being 2.23 for 1951, and 1.52 for 1952. This implies that in working with a large study area similar to the township it would be possible to adjust aerial counts by means of general correction factors such as those given above. The differences between the 1951 and 1952 ratios were caused by using different air observers each year. This will be discussed later.

In analyzing the various habitat types to determine whether the individual types also had a consistent ratio, it was found that four types in 1951 were consistent -- large lakes, small lakes and ponds, irrigation canals, and irrigation ditches. In 1952, five types showed a consistent ratio -- irrigation canals, irrigation ditches, river, creeks, and small lakes and ponds (Table III). The other types not mentioned above had too much variation between coverages to be consistent. Therefore, on those areas wherein the ratio was found to be consistent it would be possible, given the same observer, to multiply the results of an air coverage of a given type by the ratio for that type to obtain an estimate of the ground count. As can be noted in Table III, the ratio not only varies in size between the two years, but also some types which were consistent one year were not the next. This can also be attributed to the difference in observers.

Table II - Comparison of Air and Ground Counts by Coverages, 1951 and 1952

Comparison	Date	Observed Territories		Ratio:
	1951	Air	Ground	Ground/Air
Air II: Ground IV	Mid-May	78	161	2.064
Air III: Ground VII and VIII (average)	Late June	64	134	2.093
Air IV: Ground IX	Mid-July	40	101	2.525
Average Ratio -	1951			2.231
Chi-square = .8487 Good fit - average ratio may be used. Chi-square .5 = 1.386				
	1952			
Air I: Ground II	Late April	96	149	1.55
Air II: Ground III	Early May	86	130	1.51
Air III: Ground IV	Late May	67	119	1.78
Air IV: Ground V	Early June	71	104	1.46
Air V: Ground VII	Early July	60	80	1.33
Average Ratio	1952			1.52
Chi-square = 1.704 Good fit - average ratio may be used. Chi-square .5 = 3.357				

It was determined that in 1951, pairs on drain ditches were most difficult to see, while those on irrigation canals were easiest observed. In 1952, drains were again the most difficult area to observe; however, this year small lakes and ponds afforded easiest observations. It appears that aerial counts on small lakes and ponds can tally more than ground counts, hence the reason for a ratio less than 1 in Table III. The general trend for both years was that aerial counting was easier on those areas where high-growing vegetation was not present to interfere with the actual observations, and most difficult on the habitats with heavy permanent cover as drains, rivers, and creeks.

Table III - Air to Ground Comparison of Counts by Habitat Types, 1951 and 1952

Habitat Type	Average Ratio Ground/Air		Chi-square Calculations			
			1951		1952	
	1951	1952	X^2	X^2.5 (2DF)	X^2	X^2.5 (4DF)
Large Lakes	2.36	1.66	.712*	1.386	8.872	3.357
Small Lakes and Ponds	1.82	.89	.922*	1.386	.201*	3.357
Irrigation Canals	1.36	1.44	.838*	1.386	2.504*	3.357
Irrigation Ditches	2.30	1.26	.197*	1.386	1.750*	2.366 (3DF)
Drain Ditches	7.81	2.76	Insufficient Data		2.776	2.366
River	5.27	1.60	Insufficient Data		.543*	3.357
Creeks	3.56	1.81	Insufficient Data		.601*	1.386 (2DF)
Slough	2.96	2.14	1.932	1.386	3.424	3.57

* Good fit - average ratio can be applied.

Sources of Variation Between 1951 and 1952

As mentioned previously, the air-to-ground ratio differed between the two years. This was apparently caused by using a different observer for each year. The first year all aerial observing was done by the writer, while the second year's observations were made by Ervin L. Boeker. The writer had previously done no aerial counting of waterfowl and had very little flying experience. Mr. Boeker, on the other hand, was a capable pilot with experience in aerial census. Obvisouly, experience is one of the prime factors in the differences between the ratios obtained for each year.

It is possible to point out where experience helps in counting. By referring to Table III, it may be seen that without exception Mr. Boeker's air-to-ground ratio for each habitat type was much smaller than the writer's; however, the differences were larger on those types with heavy cover as river, creeks and drains. Therefore, it is possible to conclude that an experienced observer will see an even greater percent of birds on those types with dense cover than will an inexperienced observer.

Experience also plays an important part in observing all species of ducks. This is emphasized by Table IV, which shows the percent of ground-counted species seen from the air. Although the difference between mallard-like ducks was not great for the two years, only 8 percent of the teals were observed in 1951 as compared to 59 percent in 1952.

Table IV - Comparison by Species of Air-to-Ground Observations of Ducks

Year	Percent of Ground-Counted Birds Seen from the Air	
	Mallard-like	Teals
1951	55	8
1952	64	59

Brood Survey

The aerial brood count study for both 1951 and 1952 revealed that the air-to-ground ratio was not consistent between coverages. This was checked with the chi-square test resulting in a calculated chi-square value larger than the tabular value of chi-square .5. Therefore, it is acknowledged that aerial brood-counts on irrigated land in the Cache la Poudre Valley cannot be corrected to compare with ground counts. Neither may these data be used for year-to-year trend purposes, as fluctuation in the number of broods counted per coverage was not necessarily caused by more or less broods being present on the ground. Preliminary studies on other land types in Colorado, however, definitely indicate that correction factors may be applied to aerial brood-counts.

Table V compares air and ground estimates of average brood sizes for 1951 and 1952 showing that the differences were slight for both years. The smaller deviation between air and ground estimates in 1952 was attributed to the more experienced observer.

Table V - Comparison of Air and Ground Average Brood Sizes

	1951		1952	
	Air	Ground *	Air	Ground *
Number of Broods	21	59	27	38
Number of Young	112	348	149	221
Average Brood Size	5.33	5.90	5.52	5.81

* Only accurately counted broods are included from comparable ground counts.

Conclusions

From the foregoing analysis and discussion, it is possible to draw the following general conclusions:

1. A trained observer is essential to the success of aerial waterfowl census such as described.

2. Aerial counts of breeding-pairs on irrigated land types can be corrected to compare to ground counts, but the ratios between aerial and ground brood-counts were not consistent. Therefore, correction factors cannot be used to adjust aerial brood-counts.

3. One more year of study is necessary on the Cache la Poudre township to determine if the differences in the average air-to-ground ratio for breeding-pairs between 1951 and 1952 were due mainly to the experience of the observers, or to inherent differences between the two years.

WATERFOWL BREEDING GROUND SURVEY IN NORTH DAKOTA

Brandt V. Hjelle

Introduction

This report deals with the fifth annual State-wide migratory waterfowl survey carried out cooperatively by the Fish and Wildlife Service and the North Dakota Game and Fish Department, and also summarizes the waterfowl production studies carried on by the North Dakota Game and Fish Department in 1952.

Methods of Sampling and Area Covered

The annual State-wide migratory waterfowl survey was completed during the period May 6 - 20, 1952.

This survey includes two phases:

1. An aerial survey in which pilot-observer teams in light airplanes tally and geographically locate all ducks seen on 18 standardized 1/4-mile wide aerial transects crossing the entire State in an east-west direction.

2. A ground survey by automobile in which observers count and identify all waterfowl seen within 1/8-mile on either side of the road on 8 ground transects crossing the State in a north-south direction.

The 1952 aerial survey was made by pilot-observer teams furnished by the Game Management Division and Office of River Basin Studies of the Fish and Wildlife Service, and by the Pittman-Robertson Division of the North Dakota Game and Fish Department. The ground survey was made by personnel from the Pittman-Robertson Division. The ground and aerial surveys were conducted concurrently.

Breeding Population Trends

To obtain the most valid indices to State-wide populations, information regarding species composition and observed sex ratios obtained in the limited and selective ground counts, are applied to the mass population data obtained in the random and more complete aerial count.

The first step is to correct for the factor of hens absent on the nest, or otherwise missed, during the survey. In this connection, all males seen during the ground survey are arbitrarily assumed to represent a breeding pair. On this basis, data from the 1952 ground survey as summarized in Table III, indicated that observed duck populations must be increased by 35.1 percent to account for absent females. This "correction factor" is applied to the aerial data to obtain the corrected State-wide population index.

Individual species indices are obtained by applying the observed species composition percentages obtained in the ground survey to the corrected State-wide population index.

Table I - Summary of Waterfowl Data Obtained in Aerial Survey -- North Dakota May 1952

Transect No.	Sq. Mi. Sampled	Total Ducks Seen	Ducks Per Sq. Mile
1	78.0	1,076	13.8
2	80.0	995	12.4
3	79.5	912	11.5
4	79.5	852	10.7
5	80.0	982	12.3
6	80.7	1,381	17.1
7	83.0	831	10.0
8	83.0	1,121	13.5
9	84.0	1,813	21.6
10	85.0	1,300	15.3
11	85.0	1,091	12.8
12	85.0	828	9.7
13	86.0	879	10.2
14	86.0	789	9.2
15	87.7	1,384	15.8
16	89.0	964	10.8
17	90.0	1,957	21.7
18	89.0	1,086	12.2
Total	1510.4	20,241	
Average			13.4

Table III - Species Composition and Sex Ratio of Identified Ducks Recorded During Ground Survey in North Dakota - May 1952

Species	Male	Female	Total	Species Composition	
				Percent Males	Percent Total
Blue-winged teal	1,017	771	1,788	32.0	36.5
Pintail	900	255	1,155	28.3	23.6
Mallard	483	174	657	15.2	13.4
Shoveler	222	150	372	7.0	7.6
Gadwall	179	157	336	5.6	6.9
Redhead	74	42	116	2.3	2.4
Baldpate	65	50	115	2.0	2.3
Canvasback	89	30	119	2.8	2.4
Scaup	84	46	130	2.6	2.7
Ruddy duck	43	33	76	1.4	1.5
Green-winged teal	19	10	29	.6	.6
Ring-necked duck	6	5	11	T.	T.
Bufflehead	1	0	1	T.	T.
Total	3,182	1,733	4,905		

Table II - Summary of Waterfowl Data Obtained in Ground Counts - North Dakota, May 1952

Transect No.	WATER AREAS			Coot	DUCKS			
	Square Miles Sampled	Number Areas	Acres	Seen	Breeding Pairs	Total Ducks Seen	Breeding Pairs Per Sq. Mi.	Ducks Per Sq. Mi.
I	60.5	187	149	46	384	604	6.3	10.0
II	60.5	303	223	56	335	483	5.5	8.0
III	58.0	263	259	98	440	673	7.6	11.6
IV	58.0	352	804	380	916	1,440	15.8	24.8
V	61.0	254	759	279	647	1,061	10.6	17.4
VI	60.0	215	143	20	240	355	4.0	5.9
VII	51.0	132	155	48	205	293	4.0	5.7
VIII	53.0	119	124	4	66	96	1.2	1.8
Totals	462.0	1,825	2,616	931	3,233	5,005		
Averages							7.0	10.8

Table IV - State-wide Duck Populations in North Dakota as Indicated by Spring Surveys

Year	AERIAL COUNT Ducks Per Square Mile		GROUND COUNT Per Square Mile		Minimum State-Wide Population Index
	Observed	Corrected	Ducks	Pairs	
1948	11.4	17.6	11.9	8.1	1,243,704
1949	15.7	20.7	13.2	8.7	1,462,766
1950	22.2	27.6	19.7	12.3	1,950,354
1951	15.6	20.8	13.9	9.2	1,469,832
1952	13.4	18.1	10.8	7.0	1,279,037

Table V - State-wide Individual Species Population Indices in North Dakota as Indicated by Spring Surveys

Species	1948	1949	1950	1951	1952
Pintail	343,262	506,117	589,007	424,781	361,967
B-w. teal	386,792	334,973	618,262	438,010	409,292
Mallard	160,438	207,713	245,745	213,126	194,414
Shoveler	162,925	174,069	222,340	144,044	89,533
Gadwall	88,303	81,915	79,965	61,733	71,626
Canvasback	16,168	23,404	40,957	54,384	35,813
Baldpate	9,950	27,793	37.057	27,927	25,580
Redhead	36,067	45,346	50,709	38,216	29,418
Scaup	26,118	35,106	25,355	45,565	33,255
Ruddy duck	13,681	23,404	37,057	19,108	17,907
Others	-	2,926	3,900	2,938	10,232
Total	1,243,704	1,462,766	1,950,354	1,469,832	1,279,037

Comparison of the corrected aerial count population figures for 1951 and 1952 indicate a decrease of 13 percent in total duck populations in 1952. Comparison of the breeding pairs per square mile figures from the 1951 and 1952 ground counts indicate a decrease of 23.9 percent in breeding pairs in 1952.

From these data, it is concluded that the over-all State-wide 1952 spring duck breeding population in North Dakota was from 15 to 20 percent less than that of 1951.

All species except gadwall showed a decrease. Largest decreases occurred in the case of shoveler, 39 percent; canvasback, 36 percent; scaup, 28 percent; redhead, 25 percent; and pintail, 17 percent.

Success of the Season

No suitable method of obtaining satisfactory quantitative information as to State-wide duck production is known. However, for some years annual brood counts have been taken over selected routes in some of the State's better duck habitat. These counts yield certain information of questionable value as to duck production in the specific areas sampled. The sample involved is extremely small, consisting of about one-quarter of one percent of the total duck producing area. The data from these counts, shown in the following table, indicates reproductive success in 1952 to be less than that of 1951 and that considerably fewer ducks will be produced in North Dakota in 1952 than in 1951.

Table V I - Summary and Comparison of Comparable Brood Counts made in North Dakota 1948-1952

Transect	Square Miles Sampled	BROODS SEEN 1948	1949	1950	1951	1952
A	60.0	59	98	105	116	77
B	38.0	52	109	127	140	77
C	8.2	35	35	43	27	36
D	14.5	52	49	58	84	43
Total	121.0	198	291	333	367	233
Average Per Square Mile		1.6	2.4	2.8	3.0	1.9

WATERFOWL BREEDING GROUND SURVEYS IN SOUTH DAKOTA

Ray Murdy and Maurice Anderson*

Introduction

This report presents the findings of waterfowl breeding ground surveys in South Dakota during the spring of 1952. These surveys deal with the various aspects of waterfowl breeding potential and water conditions at the start of the breeding season and, at present, are not concerned with the estimation of duck production.

Methods of Sampling and Area Covered

The methods of survey were the same as in 1951, and consisted of two phases. One, a gridded State-wide aerial survey, provides the best estimates of waterfowl and water area densities and trends. The second, a ground survey in the more permanent waterfowl habitat in most of the counties throughout the State, provides a correction factor with which to correct aerially-observed duck densities for unobserved females on nests, data on species composition, and a check on waterfowl densities in the more permanent habitat in each county. These surveys were made concurrently during the week of May 12-17.

The aerial survey consisted of 16, east-west, 1/4-mile wide transects, spaced 12 miles apart north to south. These transects totaled 5,720 linear miles or 1,430 square miles, and were flown by three pilot-observer teams.

The ground survey consisted of 2,424 linear miles or 606 square miles of standardized, 1/4-mile ground transects run in 48 counties by 37 state game wardens.

Water Conditions

At the start of the breeding season, when the aerial surveys were made, there was an abundance of water areas and water levels were very high. However, very little rainfall occurred during the late spring and summer making this period one of the driest on record. This was especially true in the central portion of the James River Valley area. Fortunately, water levels were high at the start of the breeding season as the result of the very wet summer of 1951 and heavy snows during the winter of 1951-1952. Because of these high initial water levels relatively few of the more permanent water areas went dry until mid-summer.

In the Prairie Hills the more permanent water areas (Class C or better) did not start to go dry in numbers until mid-August. Thus the drying up of water areas did not seriously affect brood production. In respect to the longevity of water areas the breeding season of 1952 was similar to that of 1950 which had better than average water conditions for brood production.

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* Small Game and Furbearer Research Project (17-R).

Water Area Densities

The aerial survey indicated an 8 percent increase in the State-wide density of water areas over that of 1951. The average State-wide water area density in 1952 was 6.09 per square mile compared with 5.63 water areas per square mile in 1951.

The physiographic distribution of water areas was such that the highest density (10.41 per square mile) occurred in the James River Valley. The Prairie Hills and Minnesota Valley ranked next with 9.44 and 8.32 water areas per square mile respectively. The Missouri Hills averaged 5.36 water areas per square mile, and the Missouri Plateau, 3.53.

All of the physiographic divisions showed substantial increases in water area densities, except the James River Valley which had a slight (5 percent) decrease. The percent of increase in water area density in the other areas were 29 percent in the Minnesota Valley, 23 percent in the Prairie Hills, 20 percent on the Missouri Plateau, and 11 percent in the Missouri Hills.

Breeding Population Trends

The average, minimum State-wide duck density was estimated to be 104 percent above the 1951 level. The aerial survey indicated an observed duck density of 10.96 birds per square mile. A correction factor of 1.22 was calculated from ground transect data to correct the observed density for unobserved females on nests. Thus, the density when corrected for unobserved females indicated an average minimum State-wide density of 13.37 ducks per square mile, which is 104 percent above the 1951 estimate of 6.57 ducks per square mile. A comparison with the 1950 density indicates the average minimum State-wide density in 1952 to be 67 percent higher than the 1950 density of 8.00 ducks per square mile.

Duck densities on the ground transects in the more permanent habitat in each county showed a substantial increase of approximately 45 percent above the 1951 density. Total pairs of ducks averaged 14.0 per square mile, which is 49 percent above the 1951 density of 9.4 total pairs per square mile. Total ducks averaged 24.3 birds per square mile, or 41 percent more than the 1951 density of 17.2 total ducks per square mile. The difference between the 45 percent increase in duck density on the ground transects and the 104 percent increase on the aerial transects is believed to reflect a difference in the relative stability of duck populations in the more permanent habitat (ground transects) compared with that over the State as a whole (aerial transects).

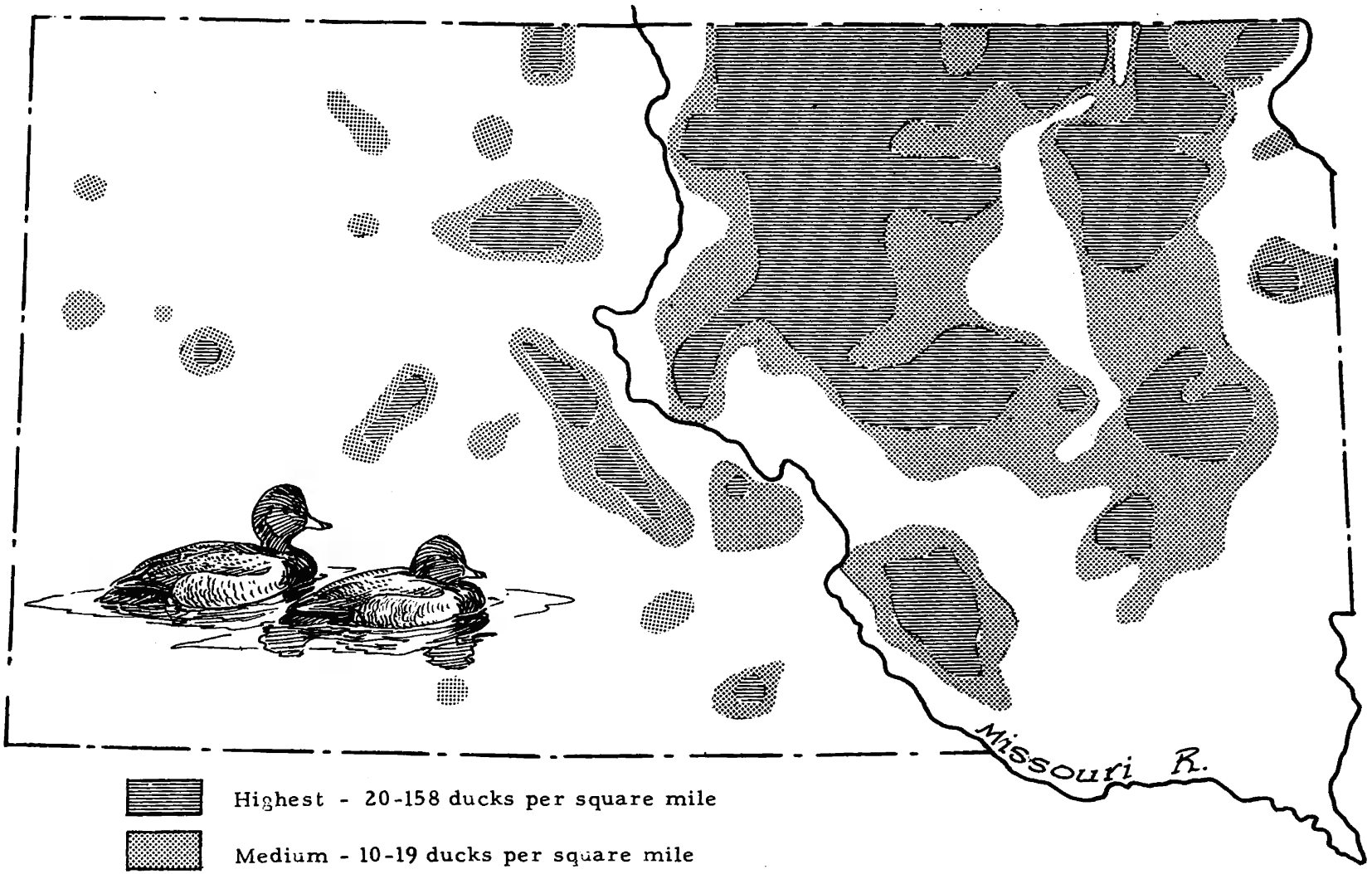
Coots were 77 percent more abundant on the ground transects than they were in 1951. There was an average density of 5.5 coots per square mile, compared with 3.1 per square mile in 1951.

Waterfowl Distribution

The geographic distribution of the 1952 breeding duck population is shown in Figure 1. The more important changes from the distribution in 1951 are: (1) an expansion of the usually medium to high density area in McPherson and Edmunds and eastern Campbell and Walworth Counties further west into Campbell and

GEOGRAPHIC DISTRIBUTION OF THE BREEDING DUCK POPULATION

SOUTH DAKOTA - 1952



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Walworth Counties, east into Brown County, and south through Faulk, eastern Potter, and western Spink Counties into eastern Sully, northern Hyde, and most of Hand and Beadle Counties, (2) an expansion of the usually medium to high density areas of Roberts, Marshall, and Day Counties and Kingsbury, Brookings, Miner and Lake Counties through Clark and western Codington and Hamlin Counties, (3) an expansion of the usually medium to high density area in Stanley County into northeastern Jones County, and (4) the presence of local medium to high density areas in Lyman, Dewey, and Corson Counties.

Physiographically, the distribution of the breeding duck population was such that the highest and very similar duck densities occurred in the James River Valley, Missouri Hills, and Prairie Hills (Table I). Average minimum duck densities were 23.68 per square mile in the James River Valley; 22.06 in the Missouri Hills; 21.48 in the Prairie Hills; 10.92 in the Minnesota Valley; and 5.17 on the Missouri Plateau.

All of the physiographic divisions showed substantial increases in duck densities over those of 1951. However, the areas showing the greatest relative increases where the James River Valley (160 percent) and Missouri Plateau (110 percent); while the areas showing the least increase were the Missouri Hills (81 percent), Prairie Hills (53 percent), and Minnesota Valley (77 percent).

Estimates of the minimum duck populations in each of the physiographic divisions appear in Table I. These figures reveal that the distribution of the breeding duck population in 1952 reflected the usual trend during wetter years of increased relative use of the lowlands with a corresponding decrease in the use of the hill areas. As a result the James River Valley contained 44 percent of the State-wide population in 1952, compared with 35 percent in 1951. The Missouri Plateau contained 20 percent of the birds during both years. Decreases in relative utilization occurred in the other divisions. The Prairie Hills showed the greatest decrease from 24 percent of the State-wide population in 1951 to 17 percent in 1952. The Missouri Hills and Minnesota Valley decreased in relative utilization from 19 percent to 17 percent and from 2 percent to 1 percent respectively.

Species Composition and Densities

Estimates of the species composition of the breeding duck population were based on the number of males of each species observed on the ground transects Table (2). Changes in the species composition from that of 1951 were increases in the percent composition of the blue-winged teal, pintail, ruddy, and canvasback; and decreases in the relative abundance of the mallard, shoveler, gadwall, redhead, and scaup. The species which increased the most in relative abundance were the pintail which rose from 19 percent to 25 percent of the population, and the blue-winged teal which increased from 41 percent to 44 percent. Substantial decreases in percent composition occurred in the mallard, 17 to 15 percent; shoveler 10 to 7 percent and gadwall, 4 to 3 percent.

Species densities were used to interpret the significance of changes in species composition. These values were calculated by applying each percent of composition to the average, minimum, State-wide duck density to obtain a corresponding estimate of the density of each species (Table 2). All of the more abundant species showed increases in density except the scaup which decreased 62 percent below the

1951 density. The largest relative increases in density occurred in the canvasback (350 percent), ruddy (200 percent), pintail (169 percent), and blue-winged teal (112 percent). For the remaining species increases in density ranged from 20 percent for the green-winged teal to 79 percent for the mallard.

Since all of the species except the scaup showed substantial increases in density, the decreases in species composition mentioned above reflect varying degrees of increase species densities rather than actual decreases in species densities. The species which showed decreases in species composition were the species that increased the least in density.

Success of the Season

No survey was made to measure over-all brood production; the following is presented as impressions of the waterfowl hatch in South Dakota in 1952.

It is believed that the number of duck broods hatched was substantially greater than in 1951. However, this increased production was definitely not as great as the increase in the breeding population. The number of coot broods produced was unquestionably much greater than in 1951. The increase in coot production equalled and may have exceeded the estimated increase in the breeding population.

The information available on brood sizes suggests that the size of duck broods may not have equalled that of 1951. The average size of 202 Class I broods of all species was 7.40 compared with an average of 7.84 for 37 broods in 1951. The average size of 126 Class III broods was 6.84 with an average of 7.68 for 34 broods in 1951.

Table I - Physiographic Distribution of the Breeding Waterfowl Population and 1951-1952 Trends

Physiographic Division	Uncorrected Ducks/Sq. Mile		Corrected* Ducks/Sq. Mile		Percent Change	Est. Minimum Population		Percent of State-wide Population		
	1951	1952	1951	1952		1951	1952	1951	1952	Change
Minnesota Valley	5.36	8.95	6.16	10.92	+ 77	8,000	14,000	2	1	- 1
Prairie Hills	12.19	17.61	14.02	21.48	+ 53	114,000	174,000	24	17	- 7
James River Valley	7.91	19.41	9.10	23.68	+160	171,000	445,000	35	44	+ 9
Missouri Hills	10.59	18.08	12.17	22.06	+ 81	92,000	167,000	19	17	- 2
Missouri Plateau	2.14	4.24	2.46	5.17	+110	96,000	202,000	20	20	0
State-wide	5.71	10.96	6.57	13.37	+104	481,000	1,002,000			

* Corrected from ground transect data to compensate for unobserved females on nests. Corrected by 1.15 in 1951 and 1.22 in 1952.

Table II - Species Composition, Species Densities, and 1951-1952 Trends in the South Dakota Breeding Waterfowl Population

Species	Number of Males *		Percent Composition *			Species Densities ** Ducks per Square Mile		
	1951	1952	1951	1952	Change	1951	1952	Change
Blue-winged teal	2,644	3,894	41.05	43.62	+ 2.57	2.70	5.83	+ 112
Pintail	1,214	2,222	18.92	24.90	+ 5.98	1.24	3.33	+ 169
Mallard	1,087	1,318	16.94	14.88	- 2.06	1.11	1.99	+ 79
Shoveler	647	635	10.08	7.11	- 2.97	0.66	0.95	+ 44
Gadwall	250	272	3.90	3.05	- 0.85	0.26	0.41	+ 58
Redhead	211	219	3.29	2.45	- 0.84	0.22	0.33	+ 50
Ruddy duck	81	161	1.26	1.80	+ 0.54	0.08	0.24	+ 200
Scaup	203	87	3.16	0.97	- 2.19	0.21	0.13	- 62
Canvasback	17	62	0.26	0.69	+ 0.43	0.02	0.09	+ 350
Baldpate	44	43	0.69	0.48	- 0.21	0.05	0.06	+ 20
Green-winged teal	5	10	0.08	0.11	+ 0.03	0.01	0.01	-
Wood duck	14	3	0.22	0.03	- 0.19	0.01	T	-
Cinnamon teal	1	1	0.02	0.01	- 0.01	T	T	-
Total	6,418	8,927	100.00	100.00		6.57	13.37	+ 104

* Data from ground transects.

** Product of percent species composition and the average, minimum, State-wide duck density.

WATERFOWL BREEDING GROUND SURVEY IN THE DAKOTAS

Jerome H. Stoudt

SOUTH DAKOTA

Introduction

A waterfowl breeding ground survey was conducted in South Dakota for the fifth consecutive year. Breeding pair transects were run by U. S. Game Management Agents Everett Sutton and Roe Meyer. Brood counts were run by Agents Harry Jensen, Roe Meyer and Fred Jacobson on July 20 and again on August 4 by J. H. Stoudt. Due to assignments in Canada, personnel was not available to carry on intensive ground work to measure nesting success, breeding pair success or effects of weather and water conditions on the breeding population.

Area Covered

Transects covered were exactly the same in 1951 and using the same technique. Brood counts were made from sun-up until 8 a.m. and 5 or 6 p.m. until dark, depending on wind and weather conditions.

Weather and Water Conditions

In the main breeding ground of South Dakota, which covers a large area east of the Missouri River, there was an abundant snowfall during the winter of 1951-52. This was especially true in the Leola Hills, northern James River Valley and on eastward into the Waubay Hills, so that there was an abundance of water over most of the waterfowl breeding range when the ducks returned from the South. Due to the abundance of water in the James River Valley which is quite flat, many more pintails stayed to nest in South Dakota than is usually the rule.

The months of April and May were abnormally warm and although very little rain fell during the breeding season the hills areas still had plenty of water at the time the broods came off and were developing. The temporary pools on the James River Valley dried up fast and as usual a big build-up occurred in the Hills areas after a large percentage of first nesting attempts were destroyed. This high loss to first nesting attempts, especially of the pintails and mallards, is normal and occurs almost every year. Both agriculture and heavy predation combine to effect this loss to early nesting species.

At the present date of writing (September 15) the Hills area of South Dakota is dryer than it has been for years with many so called semi-permanent or Class C (Bach) water areas completely dry.

Breeding Population Trends

As stated above, the breeding pair census was accomplished by Game Agents Sutton and Meyer. Following is a table summarizing results of this survey.

Table I - Breeding Pairs in South Dakota (88 Square Miles of Ground Transects)

Species	Breeding Pairs		Pairs Per Sq. Mile		Percent Change	Species Composition	
	1951	1952	1951	1952		1951	1952
B-w. teal	835	864	9.49	9.81	+ 3.5	39.0	36.1
Pintail	490	652	5.57	7.41	+ 33.1	22.9	27.3
Mallard	292	335	3.32	3.81	+ 14.7	13.6	14.0
Gadwall	228	226	2.59	2.57	Same	10.6	9.4
Shoveler	142	159	1.61	1.70	+ 11.9	6.6	6.6
Redhead	63	75	0.72	0.85	+ 19.0	2.9	3.1
Baldpate	31	16	0.35	0.18	- 48.0	1.4	0.6
Lesser scaup	18	28	0.20	0.32	+ 55.5	0.8	1.2
Ruddy duck	25	12	0.28	0.14	- 52.0	1.2	0.5
Canvasback	10	9	0.11	0.10	- 10.0	0.5	0.4
Ringneck	1	11	0.01	0.13	-	Tr.	0.5
Unidentified	1	1	0.01	0.01	-	Tr.	Tr.
Total	2,142	2,392	24.34	26.05	+ 11.7		

The foregoing table indicates an increase of 11.7 percent for all species. Transect D in the Waubay Hills showed a 30 percent decrease while all other transects showed an increase or nearly the same. This was due to the fact that a new road constructed on Transect D, shortened the distance considerably and pair data were not comparable to 1951 data. Excluding transect D, the increase would have been 15 percent. Aerial surveys of the entire State showed a 100 percent increase in total ducks but this was due to a large population of ducks in the temporary water on the flat, agricultural land. Ground transects in South Dakota do not include a large enough sample of this type of habitat in years when an abnormal amount of water is present.

Water areas increased on the transects from 739 to 1,091 or 46.5 percent, but the pintail made up most of the 12 percent increase in breeding pairs and as they prefer the prairie to the hills area the increase in water areas on transects was not reflected by a corresponding increase in ducks.

The Leola Hills and areas west of the James River show an over-all increase of 14.2 percent in breeding ducks with a 61.2 percent increase in water areas. The Waubay Hills and areas east of the James River show a 9.5 percent increase in breeding ducks with a 35.2 percent increase in water areas. The over-all increase in breeding ducks is mainly reflected in the flat agricultural areas where the big increase in water areas occurred. The more permanent areas in the Waubay and Leola Hills areas showed very little change in breeding intensity.

It is apparent from the above data and from brood data obtained later on that at the time the breeding pair census was taken, all of the ruddy ducks had not yet arrived on the breeding grounds. The breeding season seemed to be a bit earlier than last year and a heavy percentage of the breeding pairs were represented by lone drake mallards and pintails. Some shovelers were nesting and a few blue-winged teal were believed to be lone drakes. One blue-winged teal and two mallard nests were found during the breeding pair survey.

Success of the Season

Although intensive ground work was not done in 1952 there is no reason to believe that nesting conditions were abnormal. The nesting season was dry with no protracted cold or rainy spells which would adversely affect newly hatched ducklings. No known die-off of the usual predators occurred but agricultural operations were somewhat ahead of normal with plowing of remaining stubble and seeding of small grains accomplished a few days earlier than usual.

Due to the early season, brood counts were attempted as early as July 10 by Agents Jensen, Meyer and Jacobsen, but it was too soon to find any broods except early broods of pintail, mallard and canvasback. On July 19-21 all brood transects were run with the following results:

Table II - Number of Broods - July 19-21 Coverage

Species	1951	1952
Blue-winged teal	151	94
Pintail	34	39
Gadwall	35	16
Mallard	18	15
Redhead	15	9
Shoveler	10	4
Ruddy duck	9	9
Lesser scaup	7	1
Canvasback	6	3
Baldpate	2	3
Unidentified	5	-
Total	292	193

The above data indicated a 34 percent decrease in brood production and the ground transects showed an increase of 12 percent and State aerial surveys indicated a 100 percent increase in breeding pairs, it was decided that the transects would be run again. On August 4 and 5 the brood transects were run again by Jerome H. Stoudt with the following results:

Table III - Number of Broods - August 4-5 Coverage

Species	Number of Broods		Broods/Sq. Mile		Percent
	1951	1952	1951	1952	Change
Blue-winged teal	151	180	2.29	2.73	+ 19.2
Pintail	34	49	0.51	0.74	+ 44.0
Gadwall	35	70	0.53	1.06	+ 100.0
Mallard	18	36	0.27	0.54	+ 100.0
Redhead	15	22	0.23	0.33	+ 46.7
Shoveler	10	16	0.15	0.24	+ 60.0
Ruddy duck	9	33	0.14	0.50	+ 267.0
Lesser scaup	7	19	0.11	0.29	+ 171.0
Canvasback	6	3	0.09	0.05	- 50.0
Baldpate	2	2	0.03	0.03	0.0
Green-winged teal	0	1	-	0.01	-
Unidentified	5	17	-	-	-
Total	292	448	4.43	6.79	+ 53.4

Table III indicates an increase of 53.4 percent in number of broods over 1951. Due to the large number of Class I broods seen on August 4 and 5 which had hatched since July 20, it is evident that the brood survey should have been made after July 25, and this is the case every year. The late hatch in the Hills Area of South Dakota is due to the fact that when first nests are destroyed on the flat land - the breeding pairs move into the Hills Area to re-nest. This movement is caused by a drying-up of temporary areas in the James River Valley and other flat or rolling land adjacent to the Hills Area proper.

It is very possible that the increase in pintail and blue-winged teal may have been still higher. By August 4 there was an influx of teal and pintail from the North and this made identification of local "flying broods" almost impossible and some may have been missed. It is doubtful if the canvasback actually decreased, because Game Agent Jensen reported more canvasback broods on the July 10 census than on July 20.

Due to the fact that only one breeding pair census was made it is not feasible to try to compare breeding pair data with broods produced to determine an index to breeding success. If the breeding population doubled itself as indicated by aerial surveys and brood production was only 50 percent better in 1951, we can assume a lower than average production. Since no intensive ground work was done in the Dakotas in 1951, we cannot vouch for the fact that production was below average. However, if production was below normal on a "brood per breeding pair" basis, we would attribute it to the fact that the large amount of temporary water present in April and May encouraged more ducks to use the James River Valley and similar habitat. When this area dried up the ducks were forced to move to new nesting grounds at least for re-nesting attempts.

Coots

During the breeding pair survey, 1,197 coots were counted compared to only 221 in 1951. This represented an increase of over 400 percent. Although the increase may not have been quite that high the production of coot in South Dakota certainly increased far over 100 percent and on August 4 and 5 there were juvenile coots on nearly every pond where emergent vegetation was present.

NORTH DAKOTA

Introduction

The 1952 ground transects in North Dakota were run by U. S. Game Management Agents Harry Jensen and James Foote during the week of May 5-10, covering the same area and using the same technique as in previous years.

Weather and Water Conditions

The heavy snowfall that occurred in northeastern South Dakota extended into North Dakota about as far as Bismarck but tapered off toward the southeast corner of the State so that the only portion of the good waterfowl habitat which received benefit lay in the Missouri Coteau area from the South Dakota line northward about 50 miles. The blanket of snow became progressively thinner in a northward direction until the tier of counties bordering Canada was reached, where there was

very little snow all winter. April and May were warm and dry and while nesting conditions were good there was actually less water in the State than in 1951.

Although water levels were lower than in either 1951 or 1950, emergent vegetation disappeared from many areas and open water areas were present in July and August which had contained vegetation in 1951. This was caused by the high water of previous years.

Breeding Population Trends

Results of the May breeding pair census is as follows:

Table IV - Breeding Pairs (Pairs Plus Lone Drakes)

Species	Total Breeding Pairs		Pairs Per Sq. Mile		Percent Change	Species Composition	
	1951	1952	1951	1952		1951	1952
Mallard	586	682	4.0	4.7	+ 16	13.4	16.8
Gadwall	344	334	2.3	2.3	- 3	7.9	8.2
Baldpate	79	66	.5	.4	- 17	1.8	1.6
Pintail	1,089	963	7.4	6.6	- 12	25.0	23.7
G-w. teal	11	18	.1	.1	+ 64	.2	.4
B-w. teal	1,425	1,261	9.7	8.6	- 12	32.7	31.0
Shoveler	371	216	2.5	1.5	- 42	8.5	5.3
Redhead	142	155	1.0	1.1	+ 9	3.3	3.8
Canvasback	115	112	.8	.8	- 3	2.6	2.7
Lesser scaup	88	124	.6	.8	+ 41	2.0	2.8
Ruddy duck	109	131	.7	.9	+ 20	2.5	3.2
All Others	2	-	-	-	-	-	-
Total	4,361	4,062	29.8	27.8	- 7	100	100

Thus the 1952 transects indicate a loss of two pairs per square mile or about a 7 percent decrease from 1951. Water areas dropped from 1,800 to 1,732 or about 4 percent. However, it must be remembered that the ground transects in North Dakota are in better than average habitat and a good share of them lie along the Missouri Coteau which had a good run-off this spring whereas the flat area to the east and north had much less snow.

Note that although waterfowl in general showed a decrease in 1952 the mallard and most of the divers showed an appreciable increase. Lesser numbers of pintail and blue-winged teal caused most of the decrease but in neither species was the drop significant. A significant drop is indicated in the case of the shoveler, but the reason for this is unknown.

Coots dropped from 2,078 to 1,798 or 14 percent.

Transect I, which lies at the extreme south edge of the Missouri Coteau in North Dakota showed an increase of 70 percent in breeding pairs but this transect lies in the area which received a terrific amount of snow during the past winter and had 80 percent more water areas in 1952 than in 1951. From the above data and from comparisons with former years there seems to be a very definite correlation

between the number of water areas present and the number of ducks in any given year in North Dakota. There is increasing evidence to the effect that water areas in North Dakota are utilized to somewhere near carrying capacity each year, so that the number of water areas especially those up to one acre in size determines the breeding population per square mile.

The total number of ducks seen on transects dropped from 7,440 to 6,869 or 8 percent which is approximately the same decrease as for total pairs.

Success of the Season

No intensive ground work was accomplished in North Dakota during the nesting or brooding season but as in South Dakota nesting conditions were favorable and enough rain fell in June and July to maintain an adequate supply of water for broods in most areas of the State.

Brood transects were run on July 23 by Agents Jensen, Meyer and Jacobsen. Results of the 1952 brood counts compared to 1951 are as follows:

Table V - Brood Count in North Dakota (85.9 Square Miles)

Species	No. of Broods		Broods / Sq. Mi.		Percent Change
	1951	1952	1951	1952	
B-w. teal	212	138	2.47	1.61	- 35
Pintail	104	77	1.21	.90	- 26
Mallard	51	48	0.59	.56	- 6
Ruddy duck	29	20	0.34	.23	- 31
Gadwall	28	51	0.33	.59	+ 82
Shoveler	28	13	0.33	.15	- 54
Redhead	22	15	0.26	.17	- 32
Canvasback	20	18	0.23	.21	- 10
Lesser scaup	15	6	0.17	.07	- 60
Baldpate	7	1	0.08	.01	- 86
Unidentified	6	0	0.07	.00	-
Total	522	387	6.08	4.50	- 26

The above data indicates a 26 percent decrease in broods while the breeding pair count was only down 7 percent. Actually, brood counts indicated a wide variance in different parts of the State as follows:

Table VI - Numbers of Broods on Transects in North Dakota -- 1951-1952

Transect Number	1951	1952	Percent Change
I	72	61	- 15
IIA	94	114	+ 21
IIIA	78	40	- 49
IV	148	79	- 47
VI	41	45	+ 10
VIA	39	23	- 41
VIII	36	12	- 67
XII	14	13	- 7

Transects IIIA, IV, VIA and VIII which showed largest decreases were all in the northern or central part of the State where the number of water areas in May was also down 16 percent as compared to 4 percent on all transects.

The increase in gadwall cannot be accounted for and neither can the decrease in scaup and ruddy ducks which showed a good increase during the May breeding pair count. It is possible that a brood count made one week later would have produced a few more scaup and ruddy duck broods.

The following table and graph show the relative abundance of waterfowl in both North and South Dakota for the five year period 1948-1952. With the exception of 1950 the total pairs per square mile did not vary a great deal on the 225 square miles of ground transects.

Table VII - Relative Abundance of Ducks in the Dakotas for the 5-Year Period

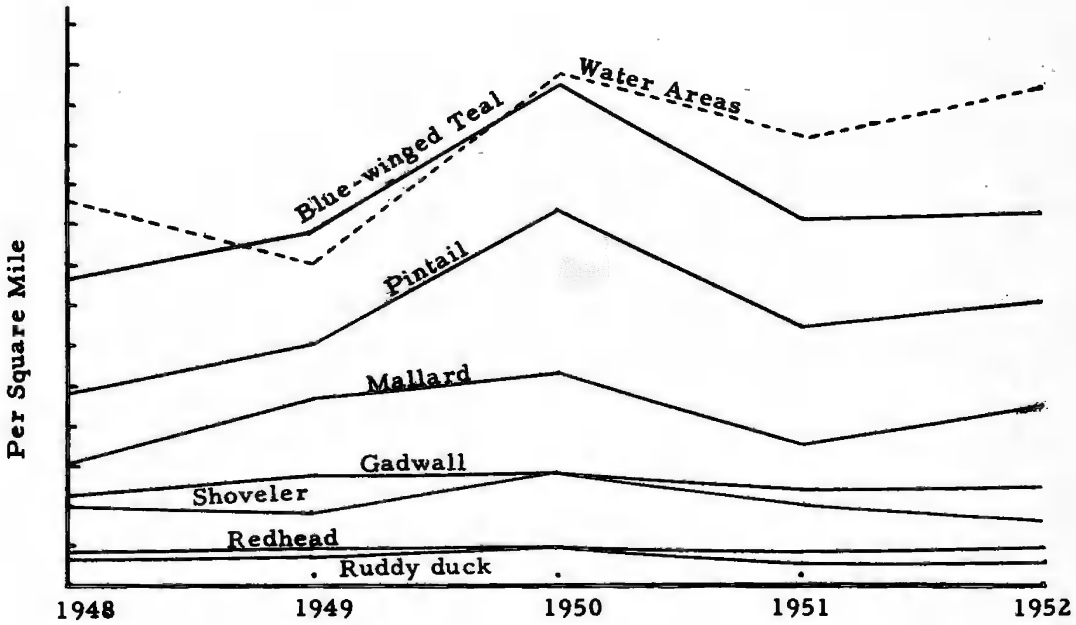
(Breeding Pairs per Square Mile on 225 Square Miles of Ground Transects)
1948 through 1952

Species	1948	1949	1950	1951	1952	5-Year Average
B-w. teal	7.7	8.8	12.6	9.3	9.5	9.6
Pintail	4.9	6.0	9.4	6.5	7.2	6.8
Mallard	3.1	4.7	5.4	3.8	4.5	4.3
Gadwall	2.3	2.8	2.9	2.4	2.5	2.6
Shoveler	2.0	1.9	2.9	2.1	1.7	2.1
Redhead	0.8	0.9	1.0	0.9	1.0	0.9
Ruddy duck	0.7	0.8	1.0	0.6	0.6	0.7
Canvasback	0.3	0.4	0.7	0.6	0.5	0.5
Lesser scaup	0.2	0.3	0.2	0.5	0.7	0.4
All Others	0.3	0.6	0.8	0.4	0.5	0.5
Total	22.3	27.2	36.9	27.1	28.8	28.4
Water Areas Per Sq. Mile	9.7	8.1	12.8	11.3	12.6	10.9

The average of 28.4 ducks per square mile is probably a pair or so above par for this area, in fact 1949 and 1951 were normal years in nearly all respects and 27 pairs per square mile could be considered "par" for the Dakota transects. Notice how the 7 most abundant species all follow the general pattern.

It is also extremely interesting to note the fairly close correlation between number of water areas per square mile and the breeding pair population. The number of water areas would have been even higher in 1950 except in many cases several small areas were flooded and joined together making one large area. Transects run in 1948 and 1949 were not in the same areas in all cases nor were they as extensive as during the period 1949-1952, and while the 1948 and 1949 transects seemed to give a representative sample of the duck population it was not necessarily true of the water areas.

Duck Population Trends Expressed in Breeding Pairs per Square Mile in North and South Dakota



In general it can be stated that the breeding pair population of waterfowl in the Dakotas has varied directly with the number of water areas per square mile during the past five years. It should be possible to determine the closeness of this correlation between water areas and ducks if data from the entire breeding grounds are assembled. Size of water areas is also important, the smaller areas being more heavily populated in a unit basis. The number of water areas per square mile is more important than the total acreage per square mile.

Table VIII - Brood Averages -- Class III Only (North and South Dakota Combined)

Species	1949	1950	1951	1952
B-w. teal	7.54	7.37	7.74	7.56
Pintail	5.69	5.93	5.73	6.67
Gadwall	7.40	8.29	7.75	6.80 *
Mallard	6.67	6.25	7.24	6.62
Shoveler	6.54	7.31	7.37	5.50 *
Ruddy duck	6.50	5.00	-	4.80
Redhead	6.25	-	7.33	7.00
Lesser scaup	-	7.00	-	6.18

* Too few broods to give accurate averages.

Brood counts in 1952 were made from July 10 to August 6 but mostly between July 19 and August 6. As a result only Class III broods are comparable to previous years when averages included brood counts from May through August 15. Blue-winged teal data in 1952 were based on 203 Class III broods and pintails on 124 broods. The Class II I average for pintails is exceptionally high.

Summary

Over most of the breeding area in South Dakota there was more water in 1952 than in 1951 during the spring breeding pair count. In general, North Dakota had less water than in 1951. Weather conditions were particularly optimum for nesting. Ground transects in South Dakota indicated a 11.7 percent increase in breeding pairs per square mile. Brood transects were up 53.4 percent. Ground transects in North Dakota indicated a decrease of 7 percent in breeding pairs per square mile. Brood transects were down 26 percent. The decrease in waterfowl in North Dakota was apparently due to a lesser number of water areas than in 1951.

WATERFOWL BREEDING GROUND SURVEY IN NEBRASKA - 1952

Harvey W. Miller

Introduction

The Nebraska Breeding Ground Survey has been conducted for the fifth consecutive year. This survey is aimed at providing indicators to the waterfowl population through measuring the seasonal and year by year trends in breeding numbers and production success. The survey recognizes the sandhill region as the most important waterfowl-producing area of Nebraska and therefore, studies have been largely concentrated there.

Methods of Sampling and Area Covered

The sandhills are sub-divided into three main waterfowl producing areas and for the purpose of this survey, these are sampled as the western, central and eastern areas. The samples are taken over ground routes using the one-fourth mile transect method. Aerial counts made by the Fish and Wildlife Service, Game Management Division and the Nebraska Game Commission in former years were discontinued for the 1952 season. One aerial count was made over the central sandhills by the Fish and Wildlife Service, River Basin Studies (Grand Island Office).

All ground counts are made from autos using binoculars and spotting scopes to aid identification. The roads and trails over which the counts are made generally follow valleys and skirt the dry roughs. This limits the data to use as trend indicators only.

Weather and Water Conditions

The 1951 season was the wettest of the past several decades. The carry-over from this resulted in high lake levels and numerous potholes at the outset of the 1952 breeding season. Indications are that in mid-April, available water area was nearly double that of a normal year.

The 1952 season has experienced near drought conditions over the sandhills in general with high temperatures and high winds starting in May and continuing until mid-September. Rainfall has been scant or entirely lacking over the entire area.

Results were that by mid-May pothole numbers were about that of a normal year and that by mid-June, less than ten percent of the potholes had water in them. Local residents reported that the total water area available to a waterfowl population at the time of the breeding population counts was about that of a normal year. At the time of the mid-July brood counts, the reports indicated somewhat less than normal water area and by September, some lakes were dry for the first time since the late 1930's.

Breeding Population Trends

The data for Table I was furnished for this report by the Missouri River Basin Studies, Grand Island Office. The transects follow the Valentine-Thedford Highway for the ground count and follow and parallel it for the aerial counts. Three observers made the 1952 ground counts as compared to one observer for the 1951 counts.

Table I - Central Sandhills Transects, Air and Ground

Aerial Count *		Ground Count **		
Date	Ducks per Square Mile	Date	Ducks/Sq. Mile	Pairs/Sq. Mile
5/24/49	6.8			
5/24/50	8.3			
5/18/51	7.5	5/14/51	12.1	3.1
5/20/52	7.7	5/20/52	30.3	11.2
Percent Change	+ 16		+ 150	+ 261

* 1952 count by W. Sweeney and R. Goodman
** 1952 count by W. Sweeney and G. Larson

Table II - Western and Eastern Sandhill Ground Transects*

	Western Routes	Eastern Routes	Over-all Routes
Square miles sampled	33.1	8.2	41.3
Ducks in Sample	1,093	152	1,245
Ducks per square mile	33.0	18.5	30.1
Pairs sampled **	671	112	783
Pairs per square mile	20.3	13.7	18.9
Percent change from 1951			
Ducks per square mile	- 4.1	(flooded trails prevented	
Pairs per square mile	- 4.2	1951 counts)	

* Counts made June 9, 10, and 11, 1952
** Actual pairs plus territorial drakes

The decrease in breeding population shown in Table II may be due to the advancement of the 1952 season over that of 1951. The hatching dates and other phenology were from one to two weeks earlier than those of 1951. Using this and the average daily decline in apparent breeding numbers, this loss is offset; in any event, the decrease is insignificant.

This same seasonal advancement may be the cause of the much greater increase in pairs per square mile as related to ducks per square mile as shown in Table I. All observers noted the increase in territorial activity at the time of breeding population counts.

Success of the Season

Table III - Sandhill Brood Counts*

	Broods	Broods Per Sq. mile	Pairs	Broods Per Pair **
Western sandhills	82	2.5	671	.12
Eastern sandhills	84	8.6	112	.75
Over-all sandhills		(1948) 1.3		
		(1949) 3.4		
		(1950) 1.8		
		(1951) 2.2		
	166	3.85	783	.21
Percent Change		+ 76 over average + 75 over 1951		

* Counts made July 10, 11, 12, 13 and 14, 1952
** Actual pairs plus territorial drakes

The brood per pair figure for 1951 was .12 for the western sandhills or the same as found this season. This figure is not available for the eastern area.

A total of 147 different broods were identified on the western routes. This would increase the brood per pair figure to .22 for all coverages or near double that of the above count.

A factor affecting the brood count is the dry-up. This would force broods into concentration points from the rather abundant water areas shown at the time of the breeding pair counts thereby showing as increased production per breeding unit. It is believed that the water available at the time of the brooding season was comparable to that of other years and that the indicated increase in production was actual, within the limits of the sample method.

Table IV gives the species breakdown of all the 166 broods observed on the transects during the count. The average brood size is seven plus ducklings which compares with the figures from all other study years. The 1951 average of 6.5 reflects the later phenology of that season in that less of the blue-winged teal, commonly larger than the mallard and pintail broods of slightly earlier hatches, were present.

The blue-winged teal made up 37 percent of the breeding population and 61 percent of the broods. This, when compared to the 1951 figures of 33 percent and 42 percent, respectively, shows the season advancement of 1952 also. Species composition varies greatly from the western areas to the eastern areas. This is most pronounced in the blue-winged teal with 31 percent of the western breeders and 74 percent of the eastern group. Other species are more nearly represented by the brood breakdown.

Table IV - Species Breakdown, Sandhill Broods *

	Western		Eastern		Over-all	
	No. Broods	Percent	No. Broods	Percent	No. Broods	Percent
Mallard	27	32.9	4	4.8	31	18.7
Gadwall	1	1.2			1	.6
Pintail	7	8.5	4	4.8	11	6.6
Blue-winged teal	27	32.9	75	89.2	102	61.4
Green-winged teal					0	0.0
Shoveler	2	2.4			2	1.2
Redhead	11	13.4			11	6.6
Canvasback	2	2.4			2	1.2
Ruddy	2	2.4			2	1.2
Unidentified	3	3.6	1	1.2	4	2.4
Total	82		84		166	

* Those observed on transect during count.

Table V gives the sex composition of 1,068 ducklings handled in banding operations in the eastern sandhills. All but fourteen of these were of the local age group, mostly Class II and Class III. The banding was done with drive traps or by driving from the ponds and capturing them by hand, hence no sex-selectivity was shown.

Table V - Sex Breakdown, Brood Banding

Species	Male		Female		Sex-Ratio of Local Group
	Adult	Local	Adult	Local	
Blue-winged teal	3	496	9	423	117:100
Mallard	1	39		29	134:100
Pintail	1	21		12	169:100
Green-winged teal		5		6	
Gadwall		2		2	
Baldpate		2		1	
Shoveler		6		10	60:100
Total		571		483	118:100

Summary

Though weather and water conditions were not at optimum, a large breeding population and good success showed a substantial increase in production in the Nebraska sandhills. Advanced phenology may have biased the count some but the blue-winged teal shows up as the number one nester in Nebraska with 61 percent of the broods.

Banding Operations

In addition to the 1,068 ducks banded during the brood banding operations (see Table V), 363 ducks were banded to September 15, at the Spring Lake Station in Western Sandhills. This total included 250 mallards, 103 blue-winged teal, 6 pintail, 2 gadwall and 2 green-winged teal. These ducks were of the immature class for the most part.

In addition to the 1,431 ducks listed above, 4 coots, 4 long-billed curlew, 1 mourning dove and 1 black tern were banded.

WATERFOWL BREEDING GROUND SURVEY IN IOWA, 1952

James G. Sieh

Introduction

Iowa is in the initial stage of State-wide waterfowl production study and habitat improvement. Meager population trend data were gathered during the breeding seasons of 1949, 1950, 1951 and 1952. Production data have been gathered during on-the-spot check counts made on productive areas in northwestern Iowa. In 1952, aerial survey was initiated in northwest Iowa in an attempt to compare the same productive areas. A wood duck nesting box study was continued on the Lake Odessa area in Louisa County near the Mississippi River. Plans are underway to band blue-winged teal during the late summer and early fall at the Ingham-High Lakes Game Management Area near Estherville, Emmet County, Iowa.

Spring Migration, 1952

The two main river valleys on Iowa's borders caught the vanguard and main flight of migrant waterfowl during the spring of 1952. The spring flight in northwestern Iowa was skimpy at its best. Even the later flight of blue-winged teal in northwestern Iowa was smaller than usual.

Geese were reported in extreme southwestern Iowa as early as February 13, 1952. On March 18, 1952, blue and snow geese were first reported in Dickinson County in extreme northern Iowa. On this same date a warm front moving northward caused a high of 53° F. at Des Moines. By March 19, the vanguard of the main flight, along the Missouri River, had forced its way north to Sioux City. On March 19, the northern most local concentration of blue and snow geese (estimated between 3-6 thousand birds) were encountered in the Onawa flats just east of the Missouri River. Geese were present in smaller migrating numbers south to Forney's Lake in the southwestern corner of Iowa and southward to the Missouri line.

On the evening of March 21, the worst blizzard of the winter struck western Iowa and continued throughout the day and night of March 22. On the morning of March 23, the wind and snow abated, but the six foot snow drifts that paralyzed avian as well as vehicular traffic remained. Migratory waterfowl recoiled southward in the teeth of the storm, but rapid break up and thawing along the Missouri and its tributaries saw the main flight pass northward into Iowa and up the valleys of the Missouri, the Platte, the James, and the Sioux Rivers. By March 30, practically all geese were reported as having left western Iowa, and many of the mallards and pintails as well.

Reports from the eastern shore of Iowa indicated a similar migratory build-up along the Mississippi River. Waterfowl were reported from the Davenport area on February 20. These early stragglers preceded some very large local concentrations of waterfowl in the Mississippi bottoms. By March 30, most of the mallards and pintails had left the Davenport area, and moved northward. Wood ducks pushed up the Mississippi Valley in Iowa during the first week in March.

Bad weather, which forced waterfowl to seek food and shelter in the river bottoms, can probably be considered as the factor causing such large local concentrations.

In northwest Iowa between April 7-20, the river overflows, natural lakes, and sloughs were covered with lesser scaup and a few redheads and canvasbacks. These species were also found in large local concentrations in 1952, and not widespread throughout central Iowa as in 1951. The build up of diver populations in the lakes region was rapid and their numbers reached a peak about April 15. Their ranks disappeared more slowly, but by May 1 there were only a few scattered survivors.

There was no discernable blue-winged teal flight through northwestern Iowa this spring. The dribble or creep movement of this species, so characteristic of blue-wings in the fall, occurred this spring. During the last two weeks of April, the blue-wings filtered into and through Iowa leaving resident breeding birds well established in the marshes and potholes by May 7. The blue-winged teal migration was completed approximately one week earlier this spring as compared to a year ago in the Spirit-Okoboji Lakes region.

Migratory populations of coot observed in Iowa during the spring of 1952 were as few as those observed in 1951.

Weather and Water Conditions

Lakes, sloughs, and potholes were filled to capacity and overflowing again during the spring of 1952. This situation did not continue throughout the breeding season as it did the year before. The permanent sloughs (without farm drainage tile) maintained near constant water levels, but those countless potholes with functional drainage tile went dry after the nesting season began and oat seeding had finished. Skimpy rainfall during the middle and late summer was insufficient to provide for waterfowl production in tiled potholes, but sufficient to eliminate crop production for the second year in a row from these stolen duck hatcheries.

Generally, weather and rainfall were favorable throughout the State and nesting waterfowl were well provided for with the exception of wood ducks. Devastating floods along the Mississippi River inundated wood duck nests, causing immeasurable losses. It is assumed that the even more serious flooding on the Missouri River caused unknown losses to nesting wood ducks. Heavy snowfall and rapid thawing beyond the borders of Iowa contributed to these serious flood conditions.

Late summer rainfall was limited, but of sufficient quantity to maintain satisfactory water levels in most lakes and marshes. There was no apparent loss of young waterfowl in Iowa caused by lack of rainfall in 1952. Stream flow was unstable throughout the State, and fluctuating water levels were common along the major rivers and smaller streams. Iowa provided fewer wet areas for nesting waterfowl in 1952 than during the extraordinary wet year of 1951.

Success of the Season

The trend of waterfowl production in Iowa appears slightly downward as compared with a year ago, but equal to production during the nesting seasons of 1949 and 1950. Wood duck production may have been seriously reduced by floods,

IOWA
WATERFOWL BREEDING GROUND SURVEY
1952
••• LAKES, SLOUGHS, ETC.
/// AERIAL COVERAGE

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but the extent of population reduction or percent of production change along the major rivers of the State is not known. Late summer counts of wood ducks in the marshes of northwestern Iowa indicated substantial reproduction and survival of these wood ducks.

Waterfowl counts have been made on the same lakes and marshes in 1949, 1950, 1951 and 1952. These spring counts (see Table I) represented breeding adults and are only partial indicators of production trend in Iowa. Blue-winged teal and mallard production in Iowa during the breeding season of 1952 was considered normal, but slightly below the exceptional high of 1951. Redhead and ruddy duck production appeared somewhat below normal, and well below last year's high. Lesser scaup adults that have been observed well into the breeding season disappear during midsummer and are considered non-breeders. No young lesser scaup have been observed in Iowa during the last four nesting seasons. Only one pair of adult canvasback were seen in northwest Iowa during the summer of 1952, and no evidence of their nesting successfully in Iowa has been observed by the writer. There have been only two valid reports of nesting attempts, and one report of a successful brood of canvasback in northwestern Iowa since 1948.

Aerial counts were taken on May 19 and 20 (Table II). Emergent vegetation did not permit optimum aerial observation and aerial counts are planned about 10 days earlier in 1953. On-the-spot check counts were made during late summer, from July 23 through August 13, on the same areas checked for breeding adults in the spring. These counts (Table III) included resident adults and their young of the year. These late summer counts included some local concentration and migratory influx but the percentage of non-resident influx could not be determined with accuracy.

In the absence of student personnel of the Iowa Cooperative Wildlife Research Unit, a wood duck nesting box study was continued to avoid loss of data. In southeastern Iowa at Lake Odessa, 24 wood duck nesting boxes containing 72 wood duck eggs and 28 hooded merganser eggs were raised up above a predicted flood crest on April 11, 1952. All of these eggs would have been inundated and destroyed by flood waters if the nesting boxes had not been raised. Egg production per nesting box was high. Thirteen boxes were known to have contained 208 wood duck eggs or an average of 16 eggs per box. The 13 complete clutches contained from 9 to 29 eggs apiece. It was assumed that this represented a very high percentage of dump nesting caused by abnormal spring flooding along the Mississippi River. Natural nesting cavities along the river were known to have been inundated by flood waters during the early nesting season, but wood duck production recovery from re-nesting attempts could not be ascertained. Dreis and Hendrickson (unpublished M.S. thesis, Iowa State College Library) reported a very high percentage of wood duck production recovery from re-nesting attempts at the Odessa nesting boxes following the 1951 spring floods on the Mississippi River.

Waterfowl production in Iowa during 1952 can be considered good even though the trend is slightly downward when compared with production in 1951. Production was less than in 1951 because reduced rainfall provided less nesting habitat and fewer birds remained in the State to nest. The late summer build up of waterfowl in the lakes and marshes of northwest Iowa indicated successful reproduction and survival of waterfowl in this area. Wood duck production on a State-wide basis was considered reduced because of devastating floods causing early nesting losses throughout much of the available nesting habitat.

Table I - Iowa Waterfowl Counts, Spring Population (1948, 1949, 1950, 1951, 1952) Trend Data

Species	DEWEY'S PASTURE Clay County 406 Acres - 50% Censused									
	1948		1949		1950		1951		1952**	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Mallard	2	2	2	2	3	3	3	2		
Gadwall	1	1	-	-	-	-	-	-		
B-w. teal	8	8	6	6	8	7	8	6		
Shoveler	-	-	-	-	1	-	1	1		
Redhead	2	2	3	3	3	3	2	2		
Lesser scaup	-	-	-	-	2	2	-	-		
Ruddy duck	2	2	3	3	5	1	2	-		
Total ducks	15	15	14	14	22	16	16	11		
Coot	20		20		25		21			

Species	WEST HOTTES LAKE Dickinson County 312 Acres - 25% Censused									
	1948		1949		1950		1951		1952	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
N	C		-	-	1	-	-	-	-	-
o	e		-	-	-	-	-	-	-	-
t	n		8	6	6	1	-	-	-	-
	s		-	-	-	-	-	-	-	-
	u		-	-	-	-	-	-	-	-
	s		-	-	-	-	-	-	-	-
	s		-	-	-	-	-	-	-	-
	e		8	6	7	1	0	0	0	0
d			30		0		5		0	

Species	CHEEVER LAKE Emmet County 341 Acres - 100% Censused					
	1950		1951		1952	
	♂	♀	♂	♀	♂	♀
Mallard	7	-	4	3	7	3
Pintail	-	-	-	-	-	-
Shoveler	-	-	-	-	-	-
G-w. teal	1	1	-	-	-	-
B-w. teal	11	2	9	4	5	3
Wood duck	-	-	1	1	-	-
Redhead	-	-	-	-	-	-
Ringneck	-	-	-	-	-	-
Lesser scaup	2	3	-	-	-	-
Ruddy duck	-	-	-	-	-	-
Total ducks	21	6	14	8	12	6
Coot	80		12		0	

Species	FOUR MILE LAKE Emmet County 219 Acres - 100 % Censused							
	1949		1950		1951		1952	
	♂	♀	♂	♀	♂	♀	♂	♀
Mallard	6	2	6	3	8	5	7	2
Pintail	1	-	1	-	-	-	1	1
Shoveler	-	-	1	1	2	-	-	-
G-w. teal	-	-	-	-	-	-	-	-
B-w. teal	12	4	9	2	16	13	5	-
Wood duck	-	1	1	-	-	-	-	-
Redhead	-	-	4	5	1	1	-	-
Ringneck	-	-	-	-	1	1	-	-
Lesser scaup	6	2	-	-	-	-	1	-
Ruddy duck	-	-	-	-	4	2	-	-
Total ducks	25	9	22	11	32	22	14	3
Coot	72		80		40		0	

** Not Censused

(continued)

(continued)

Table I - **Iowa Waterfowl Counts**, Spring Population (1949, 1950, 1951, 1952) Trend Data

	JEMMERSON'S SLOUGH Dickinson County 160 Acres - 100% Censused								INGHAM (MUD) LAKE SLOUGHS Emmet County 25+ Acres - 100% Censused							
	1949		1950		1951		1952		1949		1950		1951		1952**	
Species	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Mallard	-	-	1	1	2	3	1	-	5	5	8	5	3	2		
Pintail	-	-	-	-	-	-	-	-	-	-	-	-	1	1		
B-w. teal	3	2	5	5	6	1	-	-	8	3	9	6	28	17		
Shoveler	-	-	-	-	6	-	-	-	-	-	-	-	3	1		
Wood duck	-	-	-	-	*12		*5		-	-	-	-	5	5		
Redhead	-	-	-	-	-	-	-	-	3	1	4	2	5	3		
Lesser scaup	-	-	-	-	5	1	-	-	4	2	-	-	-	-		
Ruddy duck	-	-	-	-	-	-	-	-	2	1	-	-	5	2		
Total Ducks	3	2	6	6	19	5	1	0	22	12	21	13	50	31		
Coot	12		10		5		2		21		0		75			

*Sex not determined and number of ducks not included in the total.

** Not Censused.

Table II - Aerial Waterfowl Counts, Spring Population (1952) Trend Data

Species	West Hottes Lake Dickinson County 406 Acres		Cheever Lake Emmet County 341 Acres			Four Mile Lake Emmet County 219 Acres		Mud Lake Slough Emmet County 25 Acres	
	1952		1952			1952		1952	
	♂	♀	♂		♀	♂	♀	♂	♀
Blue-winged teal	1	1	1	1	1	2		7	
Mallard	1					1		3	1
Wood duck								1	
Redhead								1	1
Canvasback								1	1
Lesser scaup						3		2	
Coot								17	
Unidentified Ducks	1 pair		3			4		2	
Total Ducks	5		6			10		37	

Figures in the center column indicate that sex could not be identified.

Table III - **Iowa Waterfowl** Counts, Late Summer Population (1952) Trend Data

Species	West Hottes Lake Dickinson County 312 Acres 1952	Cheever Lake Emmet County 341 Acres 1952	Four Mile Lake Emmet County 219 Acres 1952	Jemmerson's Slough Dickinson County 160 Acres 1952
Mallard	7	2	11	2
Pintail	6	-	-	-
B-w. teal	120	41	148	12
Shoveler	-	-	-	-
Wood duck	11	47	17	7
Redhead	-	-	-	-
Total Ducks	144	90	176	21
Coots	33	2	3	0

Species	Ingham (Mud) Lake Sloughs Emmet County 50+ Acres 1952	Barringer's Slough Clay County 1,053 Acres 1952	Round Lake Clay County 438 Acres 1952	Trumbull Lake Clay County 1,240 Acres 1952
Mallard	40	149	18	8
Pintail	1	23	1	-
B-w. teal	138	87	36	6
Shoveler	1	-	-	-
Wood Duck	45	32	56	1
Redhead	-	8	0	-
Total Ducks	225	299	111	15
Coots	3	0	1	3

WATERFOWL NESTING SURVEY IN MISSOURI

Lee R. Crail

In 1951 a Federal Aid project on wood ducks was established, the primary objective being to learn the roll of Missouri in the production of this species of waterfowl. In that there are a few mallards, blue-winged teal and Canada geese nesting in various parts of the State, an attempt has been made to include these in the study. Last year (1951), all conservation agents were asked to record all evidence of waterfowl nesting throughout the summer. Those agents who found indications of waterfowl nesting in their districts were asked to select a census route and these routes were surveyed this year between May 18 and 27. Thus, from now on the same areas will be sampled at approximately the same time by essentially the same personnel.

In this survey all the following observations were recorded as nesting attempts; lone drake, lone hen, pair and brood. The total nesting effort is the sum total of these observations.

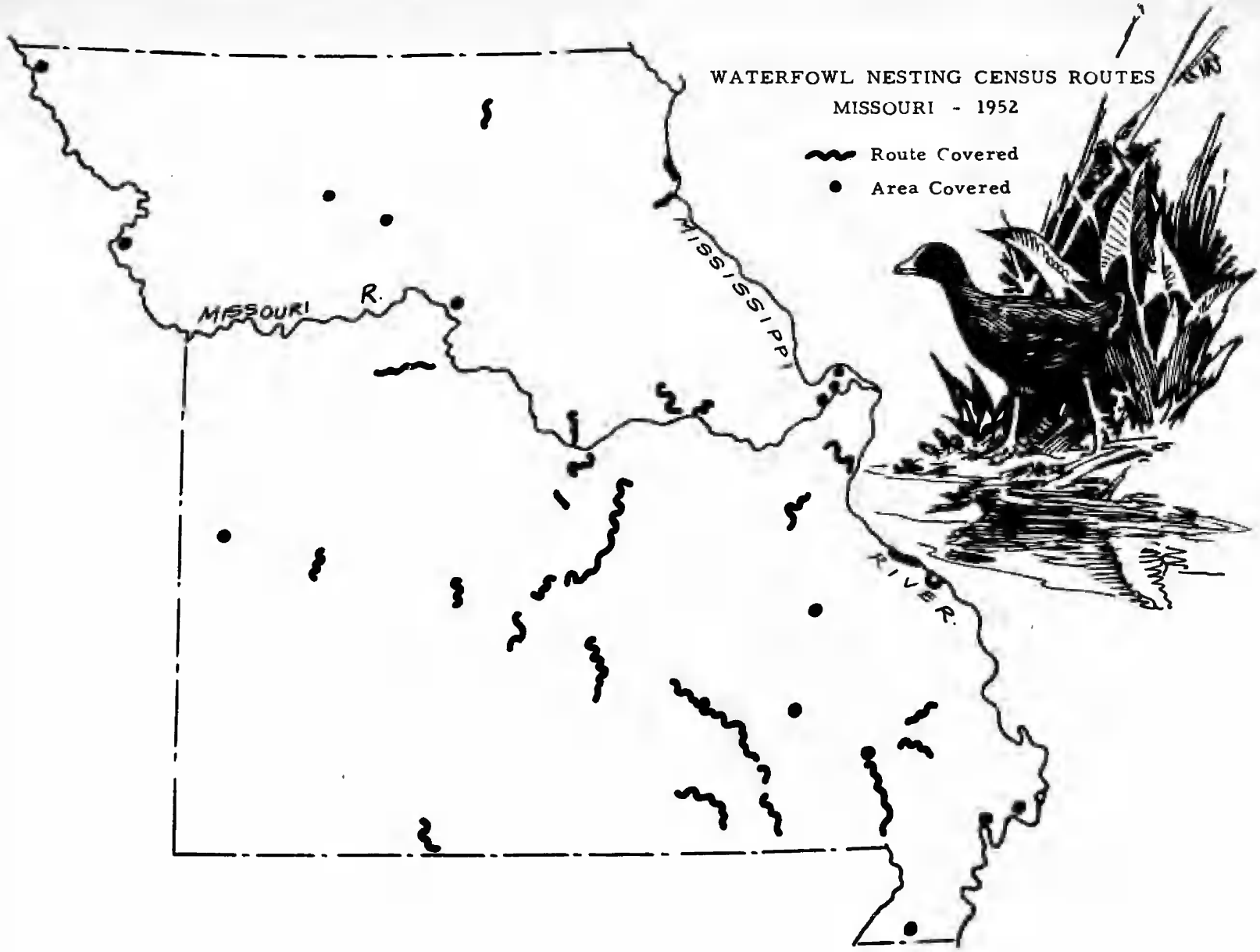
In addition to the surveys run by the conservation agents, eleven Commission biologists ran stream surveys, tabulating brood, class and ecological data. The data obtained by the biologists was not tabulated in the totals, so that in future years the data from the conservation agents will be comparative. It is felt that the biologists will not census the same area each year, but will be used more or less as "trouble shooters" in areas where specific information is needed.

Table I summarizes the data obtained by the 43 conservation agents participating in the survey, while the graph showing hatching peaks is based on observations of the 11 biologists and several other qualified observers recording data throughout the summer.

Summary

Although the 1951 and the 1952 surveys were not conducted by the same techniques, much of the data was from areas censused both years by the same personnel and it is felt that a comparison can be made.

There was a definite decline in wood duck production from 1951 to 1952 in Missouri. The data on the other species is too meager to warrant discussion.


WATERFOWL NESTING CENSUS ROUTES
MISSOURI - 1952
Route Covered
Area Covered
MISSOURI R.
MISSISSIPPI
RIVER

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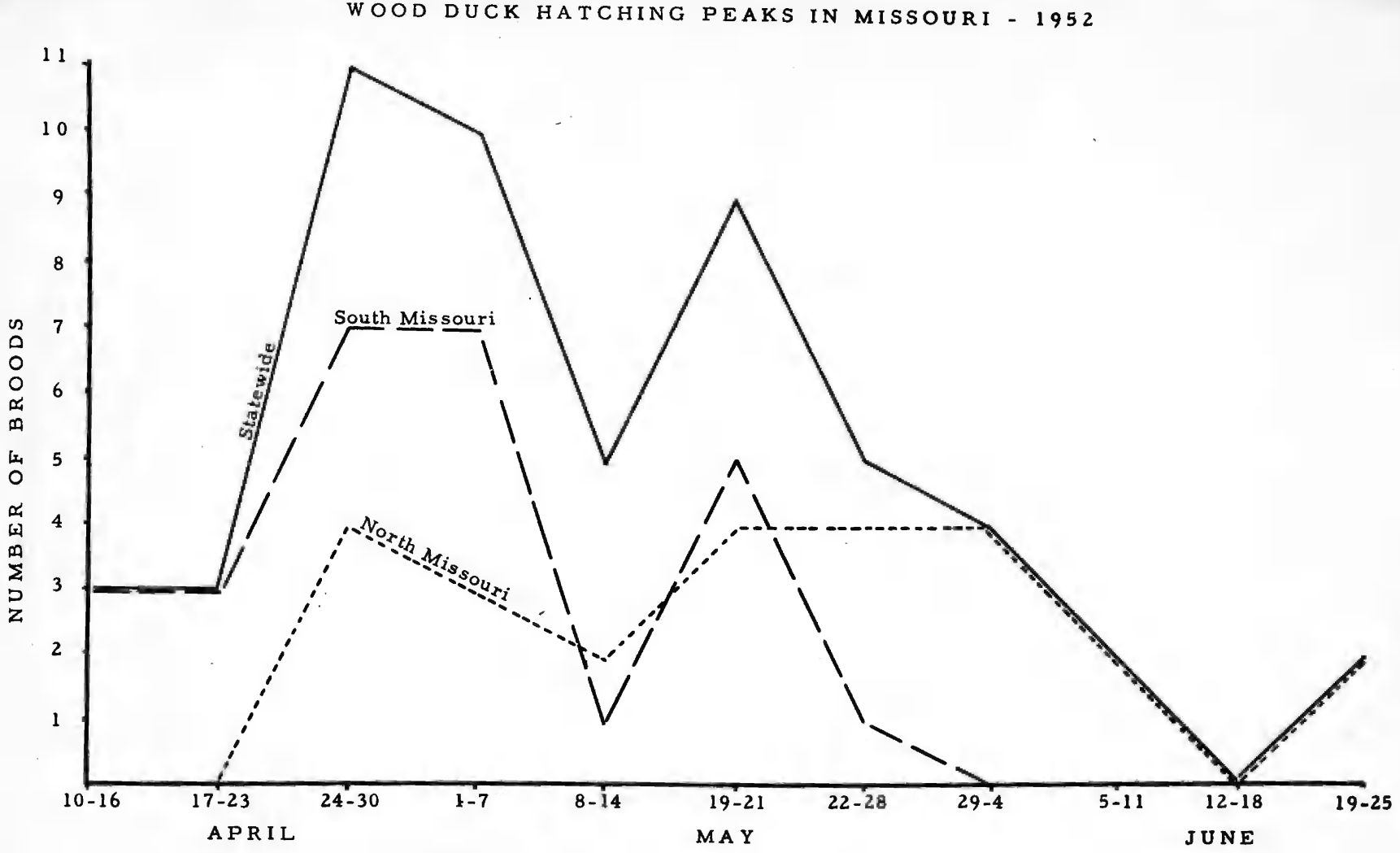
WOOD DUCK HATCHING PEAKS IN MISSOURI - 1952
NUMBER OF BROODS
11
10
9
8
7
6
5
4
3
2
1
Statewide
South Missouri
North Missouri
10-16
17-23
24-30
1-7
8-14
19-21
22-28
29-4
5-11
12-18
19-25
APRIL
MAY
JUNE

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Table I - Nesting Efforts per Census Unit in Missouri

Marsh Area Censused	Species	Lone Drake	Lone Hen	Pairs	Broods No.	Broods Total Young	Broods Yg./Brood	Total Nesting Effort	Nesting Effort Per Sq. Mi.
6,488 Acres	Wood ducks	9	2	16	13	103	7.9	40	3.96
	Mallard	2	3	10	7	41	5.9	22	2.18
10.1 sq. miles	Canada geese	-	-	-	1	6	6.0	1	-
	Marsh Total	11	5	26	21	150	7.1	63	6.24
Miles of Stream Censused									**Nesting Effort per 100 mile of stream**
212 miles	Wood ducks	9	10	9	18	125	6.9	46	21.7
	Mallard	2	2	0	0	0	-	4	1.9
	B-w. teal	3	1	2	5	47	9.4	11	5.2
	Stream Totals	14	13	11	23	172	7.5	61	28.77
GRAND TOTALS		25	18	37	44	322	7.3	124	-

WISCONSIN WATERFOWL BREEDING GROUND AND PRODUCTION SURVEYS, 1952

Laurence R. Jahn

Introduction

Through extensive ground and aerial transects employed in 1949 and 1950, it was concluded that Wisconsin produced few waterfowl when compared to parts of the prime breeding range. Therefore, in 1951 a simple spot type sampling system was initiated for following the trends in our State waterfowl breeding population. This system was again used this year and will be employed in future years.

Methods Used in Sampling

The 20 district game managers of the five administrative areas of the game division conducted the field work for the waterfowl surveys. Advisory and limited field assistance was given this group of men by personnel of the Pittman-Robertson waterfowl research project (6-R).

To follow trends in the State waterfowl picture, the method described below was used in 1951, and again this year. For a detailed discussion of the method, see U. S. Fish and Wildlife Service Special Scientific Report: Wildlife No. 13 (1951) or Wisconsin Wildlife Research X (3): 10-24 (1951). Only the highlights of the system are given in this report.

1. Each game manager was asked to cover 15 to 25 water areas in his district by ground. Districts 10 and 17 were not requested to do so since they contain practically no water areas other than rivers and streams. Each district was asked to cover nearly all the same water sites censused in 1951. Since last year was the first year this type of survey was employed, some sites chosen then were later found to be unsuitable. This year each manager was allowed to change 25 percent of the number of areas surveyed a year ago. In this way the undesirable sites were discarded. No aerial work was carried out.

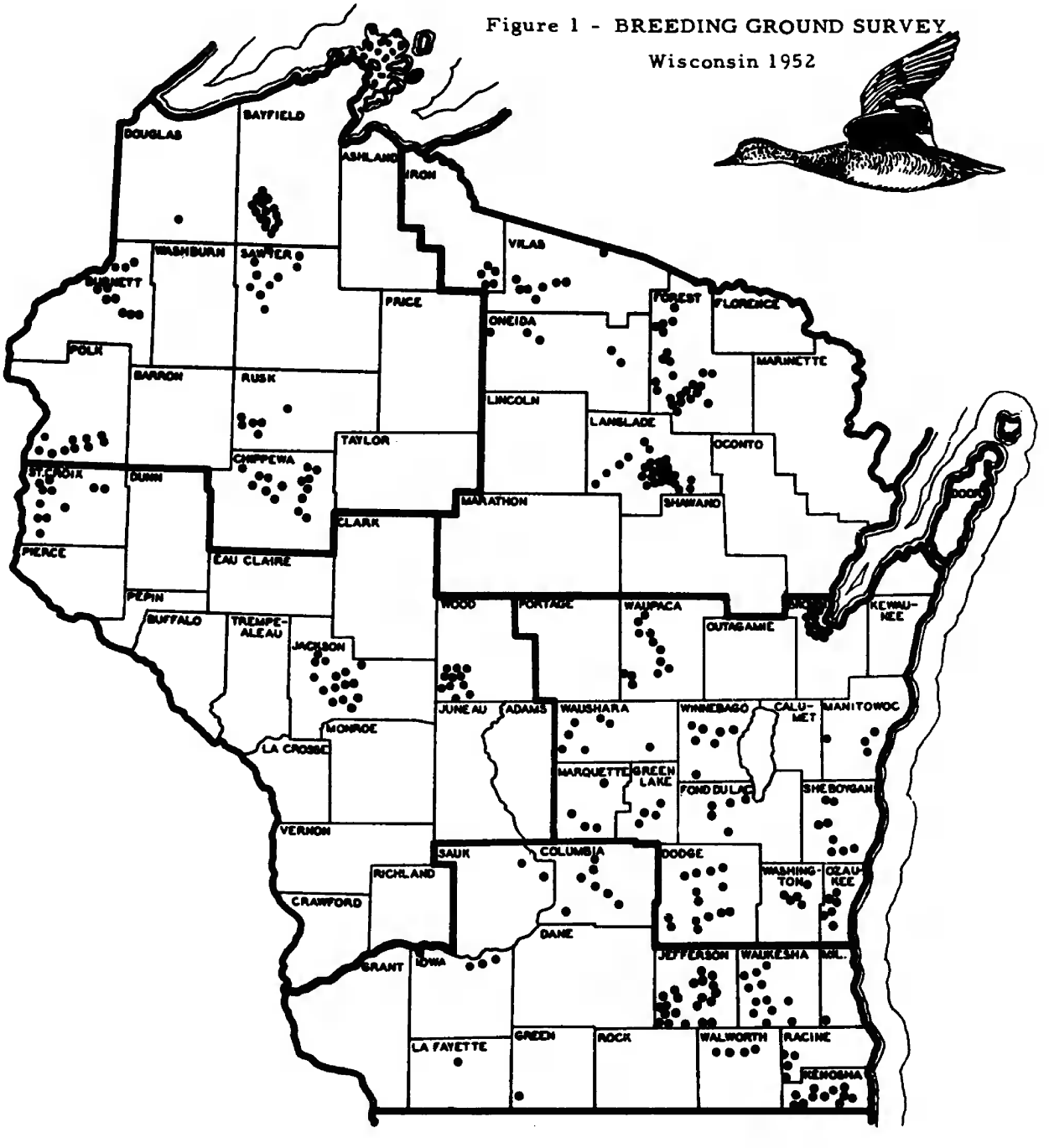
   (a) The water sites in each district were covered once during the breeding-ground survey, from May 10-30, during regular working hours. The same water areas were covered twice during the production survey, from June 11 to July 12, between 4:00 and 8:00 a.m. The hour and one-half immediately preceeding sunset was also used for running production surveys in a few cases.

   (b) Since Wisconsin lies in an ecotone, widely different phenological differences exist. To allow for these differences, the 20 game districts were divided into three groups. Each group had different calendar dates for conducting the waterfowl surveys.

2. It was urged that water sites ranging in size from 1/4 acre to 10 acres be censused. Where such areas are scarce, lakes and flowages were covered. Rivers and streams were not surveyed in the southern part of the State and only a few in the northern portion.

Figure 1 - BREEDING GROUND SURVEY

Wisconsin 1952



Water Sites Checked

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3. Water areas were classified as to size and type on the first coverage. The size of a site was the estimated number of censused acres, including the zone of emergent vegetation. The classification of water areas included:

   A - permanent, less than 10 acres in size.
   B - semi-permanent (dependable except in dry years).
   C - temporary (dry by late summer except in wet years).
   F - flowage
   L - lake, any permanent body of water which is 10 acres or larger in size.
   S - stream.

   As was done last year, a lake is defined here as a permanent body of water 10 acres or larger in size.

4. To follow water conditions experienced during these surveys, the water levels found during the production surveys (second and third coverages) were recorded, in comparison with the water levels found during the breeding-ground survey (first coverage) in the following manner:

   NC - No change L - Less water
   M - More water D - Completely dry

5. Data on waterfowl species were recorded in the usual way.

Distribution of Water Areas

Figure 1 shows the state-wide distribution of the 328 water sites censused during these surveys. It is planned to survey most of the same water sites annually.

Weather and Water Conditions

During the first three and one-half months of 1952 slightly above normal precipitation was recorded, giving early spring migrant waterfowl numerous temporary feeding and loafing areas. The spring wildfowl migration arrived in Wisconsin on schedule and left sooner than usual. The early departure was attributed to the abnormally warm, sunny and dry weather experienced during the second half of April. This midsummer weather allowed farmers to get an early start with their spring planting. The weather bureau reported that by May 1, approximately 70 percent of the spring grains had been sown as compared with only about 11 percent in 1951.

Waterfowl nesting was earlier than in 1951 by about seven days. In fact, this was the earliest season since 1947.

Between July 10 - 20, periodic heavy rains brought back early spring temporary water conditions which flooded and destroyed many crops. In one southeastern Wisconsin county, four inches of rain fell in six hours. Higher water levels resulting from these rains apparently caused only minor waterfowl nesting losses. The peak of the duck hatch occurred prior to July 10 this year (Table II).

Breeding Population Trends

With the spot type waterfowl breeding sampling system employed in Wisconsin, it is not possible to express results in ducks per square mile, as is done in the prime waterfowl breeding range. Rather, we gather information on the below listed items and on the number of flocked (believed to be non-breeding) females observed on the production surveys. It is felt these data combined with information on water conditions (i.e. floods or droughts) give us the tools to follow year to year trends in the Wisconsin waterfowl breeding picture. We are interested in drastic changes only, not minor ones.

	1951	1952	Indicate Change
No. pairs per acre censused	.078	.092	+ 18 percent
Young per breeding pair	1.55	2.74	+ 77 percent
Average brood size	6.5	6.6	+ 1 percent

Success of the Season

Of 328 water sites covered during these surveys, 57 percent were occupied by some duck species or coot during the breeding ground surveys compared to 55 percent in 1951.

Since the late waterfowl breeding season of 1950, we have experienced two spring seasons with earlier phenology. The 1951 season was about two weeks earlier than 1950, and 1952 was about seven days earlier than 1951. The chronology of the 1952 brood observations is summarized in Table II.

In 1950 many female mallards and some female blue-winged teal were observed in flocks early in the season. It was assumed these birds did not breed due to the inclement weather. In 1951 and 1952 very few flocked females were observed in any species. Flocked females are tabulated in Table III.

Table IV shows that 520 pairs of breeding ducks produced 216 broods. Complete counts on 171 broods gave an average of 6.6 young per brood.

Table I shows that of 328 water sites censused three times during these surveys, 87 percent showed no change or more water during the production surveys (second and third coverage) as compared with the first coverage.

Table I - Wisconsin Waterfowl Breeding Surveys and Water Conditions

Game Area	No. Coverage	No Change	More Water	Less Water	Dry	Percent Showing more water or no change
I - NW	2nd	13	52	0	0	100
	3rd	23	43	0	0	100
II - NE	2nd	58	3	7	0	90
	3rd	65	1	1	0	99
III - WC	2nd	28	5	5	0	87
	3rd	17	17	3	0	92
IV - EC	2nd	54	10	25	0	72
	3rd	60	6	23	0	74
V - S	2nd	35	24	9	0	87
	3rd	37	18	13	0	81
Total	2nd	188	94	46	0	86
	3rd	202	85	41	0	88

Table II - Chronology of Brood Observations in Wisconsin, 1952

Coverage Dates	DUCK BROODS OBSERVED Class I	Class II	Class III	Total
May 10-14	1			1
15-19	1			1
20-24	1			1
25-31	7	1		8
June 1-4				
5-9	3	1		4
10-14	16	27	5	48
15-19	3	6	6	15
20-24	13	31	4	48
25-30	11	24	24	59
July 1-4	5	52	45	102
5-9	11	26	13	50
10-12	1	5	12	18
Total	73	173	109	355

Table III** - Data on Waterfowl Species - Waterfowl Breeding Surveys in Wisconsin, 1952

Species	Cover-age No.	Lone Pairs	Lone Male	Lone Fem.	Flocked Male	Flocked Fem.	Un-sexed	Hens with broods	Pairs with broods	Total Adult ♂	Total Adult ♀	Total Adult Birds	Est.* tot. Prs.	Class I	Class II	Class III	Total young birds
B-w. teal	1st	142	48	4	20	3	0	0	1	211	150	361	194	1(11)	0	0	11
	2nd	45	107	14	23	0	0	31	5	180	95	275	166	18(130)	17(108)	3(21)	259
	3rd	40	72	21	18	0	0	69	1	131	131	262	133	8(68)	38(242)	25(173)	483
Mallard	1st	87	65	16	64	3	0	1	0	216	107	323	168	2(18)	0	0	18
	2nd	15	53	24	146	8	4	34	0	214	81	295	96	7(47)	24(138)	6(40)	225
	3rd	16	27	26	63	22	1	68	0	106	132	238	70	7(39)	24(171)	39(230)	440
Black Duck	1st	10	- 12 -		- 12 -		-	5	2	-	-	53	22	6(43)	1(5)	0	48
	2nd	12	- 21 -		- 33 -		-	18	0	-	-	96	33	2(12)	10(79)	7(53)	144
	3rd	5	- 23 -		- 2 -		-	15	0	-	-	50	28	0	8(43)	11(85)	128
Wood Duck	1st	19	16	4	26	8	0	0	0	61	31	92	39	0	0	0	0
	2nd	3	7	6	16	2	1	12	0	26	23	49	17	4(36)	7(47)	2(4)	87
	3rd	4	23	12	17	1	0	27	0	44	44	88	39	5(23)	14(79)	11(53)	155
Gadwall	1st	4	0	2	0	0	0	0	0	4	6	10	6	0	0	0	0
	2nd	3	1	0	6	0	0	0	0	10	3	13	4	0	0	0	0
	3rd	5	1	1	0	0	0	0	0	6	6	12	7	0	0	0	0
Pintail	1st	1	1	0	0	0	0	0	0	2	1	3	2	0	0	0	0
	2nd	1	0	0	0	0	0	0	0	1	1	2	1	0	0	0	0
	3rd	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
Shoveler	1st	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
	2nd	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baldpate	1st	1	1	1	0	0	0	0	0	2	2	4	3	0	0	0	0
	2nd	0	2	0	0	0	0	0	0	0	2	2	2	0	0	0	0
	3rd	0	0	1	3	0	0	0	0	3	1	4	1	0	0	0	0
G-w. teal	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2nd	0	1	0	2	0	0	0	0	3	0	3	1	0	0	0	0
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaup	1st	6	1	0	0	0	0	0	0	7	6	13	7	0	0	0	0
	2nd	0	1	1	0	0	0	1	0	1	2	3	2	1(4)	0	0	4
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(continued)

Table III** - Data on Waterfowl Species - Waterfowl Breeding Surveys in Wisconsin, 1952 (continued)

Species	Coverage No.	Pairs	Lone Male	Lone Fem.	Flocked Male	Flocked Fem.	Unsexed	Hens with broods	Pairs with broods	Total Adult ♂	Total Adult ♀	Total Adult Birds	Est.* tot. Prs.	Class I	Class II	Class III	Total young birds
Ringneck	1st	37	24	0	12	0	0	0	0	73	37	110	61	0	0	0	0
	2nd	7	5	3	29	2	0	7	1	42	20	62	15	6(45)	3(18)	0	63
	3rd	2	11	1	2	0	0	9	0	15	12	27	14	2(11)	6(44)	2(12)	67
Redhead	1st	3	0	2	0	0	0	0	0	3	5	8	5	0	0	0	0
	2nd	3	1	0	0	0	0	0	0	4	3	7	4	0	0	0	0
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ruddy duck	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2nd	0	1	0	7	1	0	0	0	8	1	9	1	0	0	0	0
	3rd	0	1	0	11	3	0	0	0	12	3	15	1	0	0	0	0
Canvas-back	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2nd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3rd	0	0	0	0	0	0	1	0	0	1	1	0	0	1(6)	0	6
Goldeneye	1st	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2nd	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hooded merganser	1st	0	1	2	0	4	0	1	0	1	7	8	3	1(7)	0	0	7
	2nd	0	2	2	0	3	0	10	0	2	15	17	4	3(13)	9(61)	0	74
	3rd	0	0	3	0	0	0	6	0	0	9	9	3	1(5)	4(15)	2(8)	28
Red Br. merganser	1st	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
	2nd	1	0	0	0	0	0	0	0	1	1	2	1	0	0	0	0
	3rd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified	1st	3	-	7 -	-	5 -	-	0	0	-	-	18	10	0	0	0	0
	2nd	0	-	14 -	-	0 -	-	0	0	-	-	14	14	0	0	1(4)	4
	3rd	0	-	4 --	-	0 -	-	0	0	-	-	4	4	1(4)	6(32)	0	36
Grand Total of ducks	1st	313	159(19)	31	122(17)	18	0	7	3	582	352	1,005	522	10(79)	1(5)	0	84
	2nd	90	183(35)	50	229(33)	16	5	113	6	494	247	851	363	41(287)	70(451)	19(122)	860
	3rd	72	136(27)	65	114(2)	26	1	195	1	318	339	711	301	25(150)	101(632)	90(561)	1,343
Coots	1st											86	-	0	0	0	0
	2nd											39	-	0	1(5)	1	11
	3rd											165	-	4(18)	8(36)	16(68)	122

** Figures from District 18 omitted from this table.

* Total estimated pairs based on pairs, lone males, lone females, and unidentified duck pairs and single ducks seen.

Table IV - Summary of Waterfowl Breeding Ground Survey Data in Wisconsin

Game Area	No. Coverage	No.* Acres	Est. ** Total Pairs	No. Broods	Total No. Young	Pairs Per Acre	Young per Breeding Pair
I	1st	809	62	1	11	-	-
	2nd	809	27	19	132	-	-
	3rd	809	36	30	196	-	-
II	1st	1,151	80	8	55	-	-
	2nd	1,151	55	48	299	-	-
	3rd	1,151	32	46	251	-	-
III	1st	1,471	79	0	0	-	-
	2nd	1,471	34	8	45	-	-
	3rd	1,471	15	10	54	-	-
IV	1st	1,841	169	1	11	-	-
	2nd	1,841	167	18	144	-	-
	3rd	1,841	111	66	435	-	-
V	1st***	365	132	1	7	-	-
	2nd****	311	80	37	240	-	-
	3rd	365	107	64	407	-	-
Total	1st	5,637	520	11	84	-	-
	2nd	5,383	363	130	860	-	-
	3rd	5,637	301	216	1,343	-	-
*****		5,367	520	216	1,343	.092	2.58

* Number of acres = the number of censused acres, including the zone of emergent vegetation.

** Total estimated pairs based on pairs, lone males, lone females, and unidentified duck pairs and single ducks observed.

*** District 18 figures omitted from this table.

**** Three water areas of district 16 were not censused.

***** Figures used for computing final survey ratio of young per breeding pair are 1) Number of pairs from the first coverage of all areas.
2) Number of broods and total young birds from the third coverage in all areas.

* Table V - Summary of Brood Data in Wisconsin - 1952

Species	CLASS I No. Broods	CLASS I No. Young	CLASS I Average	CLASS II No. Broods	CLASS II No. Young	CLASS II Average	CLASS III No. Broods	CLASS III No. Young	CLASS III Average	TOTAL No. Broods	TOTAL No. Young	TOTAL Average
B-w. teal	8	59	7.3	36	233	6.4	24	168	7.0	68	460	6.7
Mallard	4	29	7.2	18	117	6.5	34	212	6.2	56	358	6.3
Black duck	0	0	-	4	33	8.2	9	79	8.7	13	112	8.6
Wood duck	2	13	-	7	45	6.4	9	47	5.2	18	105	5.8
Total dabblers	14	101	7.2	65	428	6.5	76	506	6.6	155	1,035	6.7
Ringneck duck	2	11	-	6	44	7.3	2	12	-	10	67	6.7
Canvasback	0	0	-	1	6	-	0	0	-	1	6	-
Hooded merganser	1	5	-	2	12	-	2	3	-	5	25	5.0
Total divers	3	16	5.3	9	62	6.9	4	20	5.0	16	98	6.1
All ducks	17	117	6.8	74	490	6.6	80	526	6.5	171	1,133	6.6

* Figures based on complete brood counts of the third coverage only.

Therefore, 520 pairs of ducks produced 216 broods, totalling 1,426 young. Indicated known minimum duck production in Wisconsin during 1952 was 2.74 young per adult breeding pair, as compared with 1.55 young per adult breeding pair in 1951.

The average brood size for all ducks was practically the same during the last two years, being 6.5 in 1951 and 6.6 in 1952 (Table V).

Records of free-flying Canada geese breeding in Wisconsin were again scarce. Confirmed reports of goslings having been produced were received from the Necedah National Wildlife Refuge, the Sprague-Mather Refuge, and the central Wisconsin Conservation Area (all in Juneau County) the Wisconsin River (Adams County), the Swamico Game Sanctuary and the Bay Beach Sanctuary (both in Brown County), the Wood County public hunting ground, and the Horicon Marsh (Dodge County). Adult Canada geese were also reported in Marinette, LaCrosse, Jefferson, Walworth, Fond du Lac, and Oconto Counties. At this date, it is not known if any of these birds bred successfully.

Summary

The spring waterfowl migration arrived in Wisconsin on schedule, but departed from the State earlier than usual due to the midsummer weather which prevailed during the last half of April. Temporary water areas were definitely scarce in most regions of the State during this unusually warm period.

Of 328 water sites censused during these surveys, 87 percent showed no change or more water during the second and third coverages, as compared with the first coverage. Periodic rains of near cloud burst magnitude fell between July 10-20, restoring early spring temporary water conditions. It is believed these heavy rains caused only small, if any, waterfowl brood losses. The peak of the duck hatch occurred prior to July 10.

The waterfowl breeding phenology was advanced about seven days over 1951 due to the early warm April weather. Most duck broods were observed between June 10 and July 10, with the majority being of Class II and Class III age.

Minimum known duck production in Wisconsin during 1952 constituted 2.74 young per breeding pair, as compared with 1.55 young per breeding pair found in 1951. Summering flocks of non-breeding female ducks were not encountered this year.

Complete brood counts were obtained in 171 duck broods, giving an average of 6.6 young per brood. In 1951 the average brood size was 6.5 and in 1950 6.1.

On the basis of having observed very few non-breeding female ducks on these surveys, that the number of breeding pairs tallied per censused acre indicated an 18 percent increase, that the number of young observed per breeding pair showed a 77 percent gain, and that the average brood size was about the same as last year, it is concluded that the 1952 Wisconsin waterfowl production trend was upward, compared with 1951.

Summary of Summer Waterfowl Banding Operations

No trapping and banding of wild waterfowl was carried out between June 15 and September 15. Hand-reared mallards, and wild and artifically propagated Canada geese were banded and released.

Species	Adult Male	Adult Female	Immature Male	Immature Female	Immature ?	Total
Mallard (Hand-reared)	1	126	1,099	858	0	2,084
Canada geese (Wild)	2	3	2	0	0	7
Canada geese (Propagated)	5	5	76	80	1	167

WATERFOWL BREEDING GROUND SURVEYS - CHIPPEWA NATIONAL FOREST

1937 - 1952

Jerome H. Stoudt

Introduction

For the first time since the inception of the waterfowl census on the Chippewa National Forest in 1937 the author was unable to take part in the actual field work. The 1952 census was carried on by Regional Supervisor F. H. Davis and Game Management Agents Rae Sjostrom, Loren Bonde and State Warden Robert Greig, during the week of July 7 to 12. Agent Sjostrom had assisted with the census in 1951. The technique used was similar to previous years with one exception, and that was the fact that no dog was used.

Water Conditions

Water levels on the Chippewa area were about normal with the exception of Mud Lake which was above normal for the second consecutive year due to the overflow waters from the Leech Lake River. There was no abnormality in either weather or water conditions to adversely effect the conducting of the census in 1952.

Half of the 10 census areas are affected directly by water levels at the Winnibigoshish Dam. July 10 gauge readings in feet for each year of the census are as follows:

1937 - 6.60	1941 - 10.79	1945 - 10.30	1949 - 10.50
1938 - 12.03	1942 - 10.83	1946 - 9.80	1950 - 13.80
1939 - 9.57	1943 - 12.49	1947 - 11.36	1951 - 10.57
1940 - 9.72	1944 - 11.78	1948 - 9.78	1952 - 10.01

Breeding Population Trends

The following table illustrates the results of the 1952 census compared with previous years and the difference between the 1952 data and the data from 1939 to 1940 which was considered "par" for this area.

Waterfowl Population by Areas

	1939-40	1947	1948	1949	1950	1951	1952	Change From 1939
Bowstring Lake	519	498	416	337	521	545	263	- 256
Burns Lake	215	107	170	84	108	103	231	+ 16
Kitchi Lake	241	168	239	48	69	161	246	+ 5
Lower Pigeon	28	5	24	30	57	35	50	+ 22
Mud Lake	181	230	271	200	81	45	24	- 156
Rabideau Lake	94	119	215	49	64	140	193	+ 99
Raven Lake	198	33	22	17	25	18	128	- 70
Round Lake	580	490	606	574	382	565	714	+ 134
Third River	650	420	1,010	526	301	1,019	239	- 411
Winnibigoshish	568	262	88	224	157	202	104	- 464
Total	3,274	2,332	3,106	2,089	1,765	2,833	2,192	-1081

-32.9 percent

From the foregoing data it is apparent that there was a considerable decrease in waterfowl from both the 1939-40 data and from that of 1951. However, in a preliminary report, Agent Sjostrom indicated that while there may have been less waterfowl in 1952 that the decrease did not seem to be as great as the data indicated. In examining the data by areas in the foregoing table it is noted that the two areas which showed the main decrease in 1952 were Bowstring Lake and Third River. During most of the previous years these two areas were considered to be key areas which indicated quite accurately the trend of the Chippewa duck population each year. Inasmuch as these two areas contained the heaviest growth of aquatic cover and are the most difficult to census it is very possible that some ducks were missed on these areas in 1952 due to the fact that no dog was used to assist in the census and that three of the observers were inexperienced in the application of the census technique. None of the men taking the census in 1952 had worked the Bowstring area during the 1951 census.

Species Composition

The species composition in 1952 was quite similar to that in 1951 with the exception of the goldeneye which decreased to some extent. Inasmuch as these birds frequent the open water and are easily censused, the decrease was very likely an actual one. The following table compares species composition for the 11 areas in which the census was taken.

Species Composition in Percent - 1937-1952

Year	Mallard	Baldpate	Goldeneye	B-w. Teal	Wood Duck	Ring-neck	All Others
1937	32	5	20	22	-	13	8
1938	49	3	10	23	-	9	6
1939	45	4	15	28	-	5	3
1940	44	7	15	21	-	10	3
1941	47	12	11	14	-	4	6
1947	49	15	19	7	-	5	6
1948	52	17	13	10	-	8	3
1949	44	24	19	6	-	4	3
1950	43	30	17	4	-	4	2
1951	46	27	17	4	3	2	1
1952	48	27	12	4	1	2	-

The baldpate did not show an increase in species composition in 1952 but neither did it show a decrease and apparently is holding its own on the area. Blue-winged teal and ring-necked ducks maintained their low place in the population which they have done since the few years following the drought of the thirties.

Figure I illustrates population trends on a per mile shore basis.

Success of the Season

Brood averages for the mallard duck are compared in the following table for each year that the census was conducted.

Mallard Duck Brood Averages

Year	Class I	Class II	Class III	All	No. of Broods
1937	-	6.3	6.5	6.5	56
1938	8.8	7.8	6.5	7.3	166
1939	8.8	7.6	7.4	7.8	256
1940	8.7	7.4	7.0	7.8	94
1941	-	7.3	6.7	6.9	17
1947	7.8	7.9	7.0	7.5	67
1948	7.1	7.6	6.8	7.2	102
1949	4.8	6.8	6.7	6.4	31
1950	8.1	7.2	6.6	7.0	49
1951	6.6	6.8	6.3	6.5	92
1952	4.5	7.2	6.7	6.6	127

The all-time average for Class III mallards is 6.9 ducklings per brood, so that the 1952 average is only slightly below this figure. A larger percentage of Class II and III broods were seen in 1952 than in 1951 due to the fact that the Chippewa area experienced a very early spring. The low brood average of Class I broods is possibly due to the very few broods seen and due to the fact that they consisted of the results of re-nesting attempts.

Adult-Juvenile Ratios

Adult-juvenile ratios for all species of ducks seen on the census can be compared to 1951 ratios as follows:

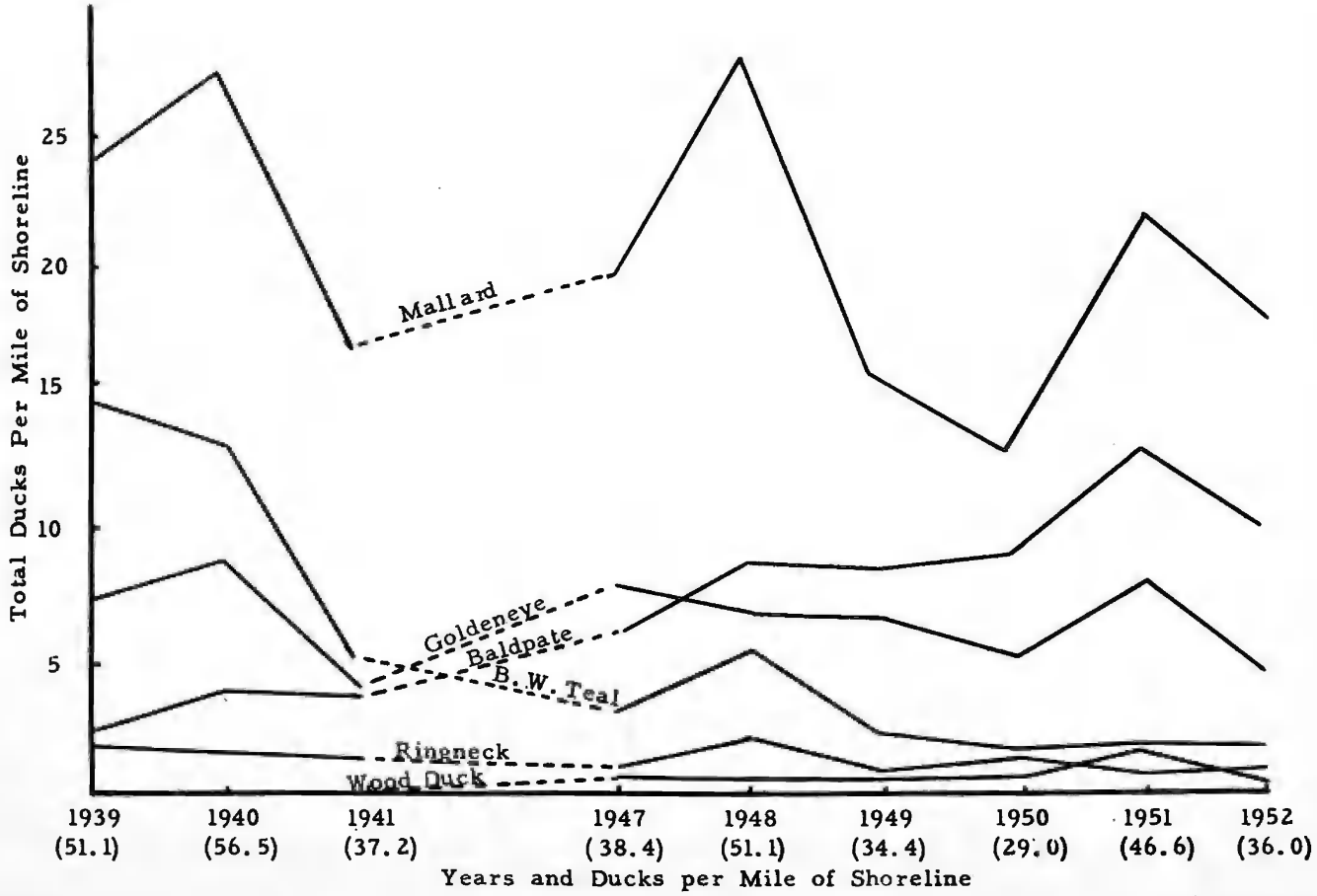
	1951			1952		
Species	Adults	Juveniles	Ratio	Adults	Juveniles	Ratio
Mallard	312	993	1 to 3.2	194	863	1 to 4.4
Baldpate	234	541	1 to 2.3	108	473	1 to 4.3
Goldeneye	109	364	1 to 3.3	71	173	1 to 2.4
B-w. teal	29	76	1 to 2.6	12	72	1 to 6.0
Ringneck	22	40	1 to 1.8	17	25	1 to 1.4
Wood duck	12	71	1 to 5.9	9	14	1 to 1.5
All Others	21	9	1 to 0.4	83	78	1 to 0.9
Total	739	2,094	1 to 2.8	494	1,698	1 to 3.4

The ratios of juveniles to adults was considerably higher in 1952 which indicates a good breeding success for the spring breeding population. Ratios of adults to juveniles for all species each year of the census is as follows:

1937	1938	1939	1940	1941	1947	1948	1949	1950	1951	1952
1:3.0	1:2.2	1:3.4	1:1.5	1:2.7	1:2.2	1:4.0	-	1:2.7	1:2.8	1:3.4

From the above data we might conclude that the ratio of juveniles to adults in 1952 was above average.

FIGURE 1. POPULATION TRENDS ON TEN CENSUS AREAS
(60.8 miles of shoreline)



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Summary

In conclusion we might summarize the 1952 data as follows:

1. Water levels were quite normal on the Chippewa area in 1952 and weather conditions were very satisfactory for a successful nesting season. Water levels were such that censusing of the Chippewa area should have been accurate.

2. The fact that no dog was used during the 1952 census makes comparison with previous census data quite difficult. Certain census areas are easily censused without the aid of a trained dog but on some of the areas escape cover is so abundant as to make the use of a good dog imperative.

3. Raw data indicates a 32 percent decrease in duck population from the "par" of 1939-1940 and a 23 percent decrease from 1951. It is very possible that the 1952 duck population was about the same as that of 1951.

4. During 1952 there was little change in species composition from previous years.

5. Brood averages are very close to normal for the area but more juveniles were seen per adult than in most previous years indicating a better than average breeding success.

WATERFOWL BREEDING GROUND SURVEY IN MINNESOTA

Forrest B. Lee

Spring Migration, Weather, and Water Conditions

The first reported arrival of migrant waterfowl was a group of twenty lesser scaup observed near Worthington on February 27. The last five days of February were dry and mild and there was some alternate freezing and thawing in the southern counties. March was considerably colder and somewhat wetter than usual. Unusually heavy snows on March 22 and 23 in the extreme southern counties resulted in near blizzard conditions. The period from March 23 to 27 was unseasonably cold over the State. The closing days of March were warm and in the southern counties, snow cover was reduced to patches and there was much water standing on fields. Several observations of waterfowl were made in the southern half of the State from March 25 to 31. These reports were of mallards, pintails, Canada geese, lesser scaup, whistling swan and goldeneyes. April was considerably warmer and much drier than usual. The first half of the month was rather cool but the latter half was unseasonably warm, especially the last five days when mid-summer temperatures were recorded. Aside from April 8, 9 and 21 when precipitation was quite general, exceedingly dry weather prevailed during most of the month. The Area X Biologist observed the first striped ground squirrel on the 9th and the first blooming pasque flower on April 25. Weather was ideal during the third week of the month for drying fields and for starting the growth of vegetation. Seeding of small grains was quite general by April 19. Severe flooding of the Minnesota and Mississippi Rivers occurred from April 13 to 20, the crest reaching St. Paul on April 16. Rain was badly needed near the close of the month, especially in northern Minnesota, where forest and brush fires were reported. The high temperature record for the State for April, 96° F., was recorded at Hallock on April 27 and Winona on April 30.

Most of the ice left the lakes in the southern part of Minnesota from April 15 to 20. Some of the more northern lakes did not open up completely until about April 27.

The bulk of the spring migration, including mallards, pintails, lesser scaup and Canada geese, was passing through the southern half of the State from April 8-16. Blue-winged teal were a little later being present in good numbers from April 18-20 on. After April 16, waterfowl were observed in good numbers in most parts of the State and much of the migration appeared to have passed on north by the warm days of April 26-30. During the closing days of the month, resident waterfowl were moving to the small water areas and occupying their territories. The unusually warm weather that characterized the closing days of April continued to May 5. Thereafter, cool weather prevailed during most of the remainder of May, which was much drier than usual. Light snows occurred on May 27, 28, and 29 in such northern counties as Roseau, Koochiching and St. Louis and light frosts occurred on May 29 in extreme southern counties. The aerial, auto, and canoe transects of the spring breeding ground survey were begun on May 5, or shortly thereafter. June was considerably wetter than usual and the month was characterized by frequent thunderstorms. While there was a large deficiency in precipitation in some northwest counties such as Marshall and Kittson, moderate to large excesses were recorded elsewhere. Severe thunderstorms occurred on June 7 in the Iron Range and Duluth areas and on June 12 and 13 in northern and east central counties. Heavy rains from June 20 to 23 caused some flooding in southeast Minnesota and tornadoes and

severe thunderstorms occurred on June 23 and 24 in central and southern counties. July was considerably wetter than usual, this being the fourth wettest July on record. Heavy rains on July 1 and 2 in west-central Minnesota caused excessive high waters in the Moorhead area. Severe thunderstorms occurred on July 9 in Polk, Norman and Clay Counties and from July 16 to 20 there were general rains. At this time particularly heavy downpours occurred in the Aitkin area.

Breeding Population Trends

The aerial sampling was begun on May 5 in southern Minnesota, commencing with Transect No. 32 and was completed on May 15 with Transect No. 1. The Bureau of Game used a Stinson Station Wagon piloted by John Zorichak, with Gerald Bue and Forrest Lee observing. Waterfowl data were recorded by Lee in 12-mile units of the quarter-mile wide sample strips. The quarter-mile strips extending in an east-west direction include approximately 2 (plus) percent of the area being sampled. Speed and altitude of flight varied with the demands of field conditions, with the extremes of approximately 80 and 120 miles per hour, and 20 to 200 feet of altitude. Approximately 51 hours of flying time were required to complete the 1952 survey.

This was the second year of the aerial transects. Transect lines total 3,108 miles, or 777.3 square miles of sample. This sample represents 37,296 square miles sampled. On these 777.3 square miles, 2,841 ducks were tallied compared with 2,785 in 1951. In terms of ducks per square mile, there were 3.66 ducks per square mile compared with 3.58 in 1951.

Much less temporary water was present in southern Minnesota at the time of the transects, and the number of waterfowl tallied was similar to the 1951 counts. Central Minnesota did not have an excess of temporary water, yet Class B and C areas had plenty of water. In central Minnesota, increases in number of ducks were noted along many transects. Northwestern Minnesota experienced a dry spring and fewer ducks were tallied on most of these transects.

Automobile transects totaling 1,230 miles were run in a north - south direction in the delineated area of the aerial sampling. Auto transects were also run in some of the Game Management Areas outside of this area, bringing the total auto transect mileage to 1,868. Almost identical routes were run in 1951. The 1951 mileage was 1,965 miles and 51 counties sampled; in 1952 48 counties were sampled. Of the ducks that could be tallied by sex, there were 523 males and 335 females.

The auto transects in the delineated area show a somewhat greater increase in the breeding waterfowl population than is indicated by the aerial transects. Pairs per square mile were 1.79 compared with 1.22, and ducks per square mile were 3.31 compared with 2.45 in 1951. It is believed the pairs per square mile figure is a better index to breeding populations since the ducks per square mile figure includes the late migrants such as scaup, which are sometimes present in the State when our local population is already beginning to nest. Since the aerial transects sample the pothole and dry areas indiscriminately, it is likely that the actual increase in breeding waterfowl is somewhat less than that shown by the ground transects. The following table shows a summary of all ground transect data compared with 1951. The water areas per square mile is slightly lower than last year, 3.1 compared with 3.5.

Percent of occupancy was somewhat higher this year, 29.6 percent compared with 20 percent. An increase is noted in pairs per square mile, 1.86 compared with 1.22. Ducks per square mile were 3.41 compared with 2.28.

Blue-winged teal, mallard and ringneck continue to be the three main species of breeding waterfowl in the State. A drop in percent composition is noted for blue-winged teal and mallard.

	Delineated Area		State	
	1951	1952	1951	1952
Counties	43	40	51	48
Total miles	1,257	1,230	1,965	1,868
Total water areas	1,332	1,097	1,693	1,451
Areas occupied	248	329	339	429
Water areas per square mile	4.2	3.6	3.5	3.1
Percent occupied	18.6	30.0	20.0	29.6
Total pairs	383	549	597	869
Pairs per square mile	1.22	1.79	1.22	1.86
Total ducks	770	1,017	1,119	1,590
Ducks per square mile	2.45	3.31	2.28	3.41
Coots	113	480	138	539

Percent Species Composition from all Auto Transects (48 Counties)

Species	1951	1952	Species	1951	1952
Blue-winged teal	54.1	41.3	Baldpate	0.9	1.0
Mallard	22.1	15.8	Goldeneye	1.0	0.8
Ringneck	14.8	13.6	Gadwall	0.7	0.6
Scaup	4.9	8.4	G-w. teal	0.2	0.3
Redhead	4.9	6.2	Canvasback	0.5	0.1
Pintail	7.1	4.7	Black duck	0.2	0.0
Ruddy duck	4.5	4.0	Unidentified	3.2	1.4
Shoveler	3.0	2.0			

Success of the Season

Brood count data were collected in 11 Game Management Areas. Counts were made during the two week period, June 30 to July 11, by the area game biologists who were assisted by biologist aides.

Miscellaneous brood size data, in addition to information from the specific counts, were incorporated for calculation of the final average brood size. All tabulated broods were classed as to "A" or "B" accuracy. Broods seen under conditions where it was apparent that the complete brood was seen, were classed as "A". Broods seen in dense cover, or conditions where only a partial count of young could be made, were classed as "B". Only class "A" broods were considered for calculation of average brood sizes. Counts were made on 50 specific areas.

A total of 433 class "A" broods containing 3,222 young was tallied - giving an over-all average brood size of 7.4. This is slightly below the 7.5 average of the previous 5 years. The average brood sizes for these years are as follows: 1951, 7.8; 1950, 7.3; 1949, 7.1; 1948, 7.9; 1947, 7.4. The average sizes of broods by age classes are as follows for the years 1949 through 1952:

Year	Class I	Class II	Class III
1952	7.4	7.8	7.0
1951	8.2	7.7	7.3
1950	7.5	7.0	6.3
1949	7.2	7.2	6.8

It appears to be normal that the average brood size becomes smaller as the young grow older. This has been the case in other years. However, this year the average size of Class I broods was considerably smaller than the Class II average. The most logical interpretation of these data is that the heavy rains of late June and early July may have inflicted some loss on the waterfowl that hatched at this time.

Brood counts on specific areas were down somewhat in northern Minnesota where breeding pair counts were about normal but where near drought conditions persisted. However, the hatch continued to come off for some time after the counts were made, and production was better than the brood count data indicated. In central and southern counties, water and weather conditions were excellent until the rains of late June and July; and production appears to have been high.

This year's broods were distributed by age class as follows: Class I, 166; Class II, 192; Class III, 75. These data would indicate that for the State as a whole, the hatch started early and was quite uniform; and that considerable broods were coming off at the time of the counts. On several areas a fairly large number of adult ducks was present at the time of the brood counts, June 30 to July 11. This was especially true in parts of the State that had had heavy rains and severe thunderstorms. Successful re-nesting, however, apparently occurred as evidenced by late broods being noted in some localities. Seventy percent of the 1952 brood size data of the 433 Class "A" broods tallied, was made up of 4 species as follows: mallard, 23.6 percent; blue-winged teal, 21.3 percent; redhead, 13.2 percent; and ring-necked duck, 12 percent.

An aerial resident waterfowl count was flown from August 21 to 28. This flight will be repeated next year to give comparative data on late summer waterfowl populations and distribution in the State. Methods were the same as used in the spring aerial breeding ground survey. The odd-numbered transects of the spring survey were flown and an additional number of good waterfowl areas were checked. These sixteen transects totaled 1,540 miles, or 383 square miles sampled. A total of 6,407 ducks was tallied on the transects compared with 1,338 ducks recorded on these same transects in May. In other words, 4.8 ducks were tallied for every duck seen on these transects on the May census. Ducks had begun gathering into moderate sized groups throughout the area flown. Some of the smaller potholes were vacated and it was common to find groups of 20 to 50 ducks on occupied water areas. A number of large concentrations was noted. An estimated 15,000 ducks, mostly puddlers, were on Thief Lake, Marshall County. The Minnesota River bottoms between Minneapolis and Shakopee contained over 5,000 ducks. This is the first year the fall aerial resident waterfowl survey has been set up comparable to the spring census. Calculated on a ducks per square mile basis, there were 16.6 ducks per square mile on the transects compared with 3.5 in May.

Area Summaries

Following are summaries of breeding pair and brood data for the Game Management Areas. These are condensations of the more detailed reports prepared by the area game biologists, and in some cases, comments of the writer are incorporated.

Area I - Milton H. Stenlund, Ely - Eighteen miles of canoe transect were run on wilderness streams and lakes in northern St. Louis County from May 12 to May 15. The route began on the Moose River and continued as follows: Nina Moose River, Portage River, Agnes Lake, Oyster Creek, Oyster Lake, Shell Lake Creek, Rocky Lake and Green Lake. Waterfowl were seen in the following numbers: black duck, 26; goldeneye, 5; mallard, 3; lesser scaup, 3; wood duck, 2; American merganser, 6; hooded merganser, 10. These species all breed in the area except the lesser scaup, for which there are no nest records. This amounts to 3.1 ducks per mile counted. Repeated counts have not been made over identical routes, because of the problem of getting assistance in canoeing the transects. It is believed that this year's breeding population was quite normal and that the breeding waterfowl population of Area I remains relatively stable from year to year. No brood size data were secured for Area I. A count on Camp 4 Lake showed no ducks. A count on Sand River showed no young, but one pair of ringnecks, one male goldeneye, two single mallards, and one black duck were noted. Broods reported early in June indicate an early nesting season.

Area II - Vernon E. Gunvalson, Bemidji - Auto transects totaling 325 miles and representing 81 square miles of area sampled were run in Beltrami, Cass, Clearwater, and Hubbard Counties. Data summarized for the entire 325 miles show 3.06 pairs per square mile and 5.65 ducks per square mile. In 1951, figures of 2.1 pairs per square mile and 3.4 ducks per square mile were obtained. The substantial difference in ducks per square mile is due in part to lesser scaups that linger on later than most species in their migration. Considering a change in the transect route which included some better waterfowl habitat (Hubbard County), and general observations in the area, it is concluded that breeding duck numbers were about the same as in 1951. Water levels during the spring were generally down, and some 1951 water areas were dry or drying up. This year there were 2.2 water areas per square mile of transect compared with 2.6 for 1951 and 2.5 for 1950. The percent of occupancy was somewhat higher this year, 40.6 compared with 30.8 last year and 35.5 in 1950. The three major species continued to be ringneck, mallard, and blue-winged teal. The duck hatch appeared to be extremely early this year and hatching conditions were excellent. An earlier brood count may have given more favorable results. Many broods were seen on some of the check areas in early June that were not seen during the regular check in July. Brood counts were completed on six water areas on which a total of 44 broods was recorded, compared with 59 in 1951. One area was not covered completely, due to adverse weather and in general, checking conditions were unfavorable. Counts were made on Upper Rice Lake and Four-legged Lake, Clearwater County; Rux Pond, Refuge Pond, and Fisheries Rearing Pond, Beltrami County; and Sucker Lakes, Cass County. A total of 42 class "A" broods contained 298 young, giving an average brood size of 7.1 compared with 7 for 1951 and 7.9 for 1950. Ringnecks, mallards, and goldeneyes made up the bulk of these broods. Considering all data, it seems that the summer duck population in Area II is approximately equal to that of 1951.

Area III - Lester T. Magnus - Roseau - Auto transects totaling 213 miles were driven in Lake of the Woods and Koochiching Counties, and a canoe transect was run on Pine Creek Pothole in Roseau County. Auto transect data indicate .53 pairs per square mile compared with .25 in 1951 and .95 in 1950. Ducks per square mile were .66 compared with .40 in 1951 and 1.66 in 1950. Occupancy of water areas was 11.1 percent compared with 14.7 percent in 1951 and 14.8 percent in 1950. The auto transect in Lake of the Woods County (96 miles) again showed a decline in the number of ducks seen, probably due again to extremely dry conditions, the county being even drier than in 1951. The Koochiching County transect (117 miles) was altered this year to shorten the route and to include better waterfowl habitat, accessible by more passable roads. The number of pairs per square mile was .75 compared with .19 for 1951. While the 1952 and 1951 data are not directly comparable due to the change in route, it is believed that the duck population in Koochiching County is about the same as in 1951 due to the dry conditions. The canoe transect of Pine Creek Pothole, Roseau County, was run on May 14. A total of 417 waterfowl was tallied this year as compared with 359 for 1951. An increase was noted in the number of gadwalls on the pothole. The brood season in Area III was very erratic, particularly in the western portion. Brood counts were made on Pine Creek Pothole, Roseau County; Battle Lake and Rat Root Lakes, Koochiching County; and the south and west shores of Lake of the Woods. The early spring would lead one to believe that the broods would be mostly Class III by the time the counts were made in July. However, this was not the case entirely, and it was noticed that areas visited several times during the month of July showed more broods late in the month. A good example of this is Pine Creek Pothole, where complete counts were made on July 1, 7, and 14, and a partial count was made on July 28. The count on July 1 showed 8 broods; July 7, 11 broods; July 14, 15 broods; and July 28, 20+ broods. One count was made in early July of 1951 and 54 broods were tallied. Water levels, particularly in the western portion of Area III, were very low and remained low with a probable drop in waterfowl production for the area. A total of 51 Class "A" broods, totaling 318 young was tallied, giving an average brood size of 6.2. Last year the final average brood size was 8.8. Of interest are two broods of Canada geese seen by Warden-Pilot John Parker along the south shore of Lake of the Woods on several occasions.

Area IV - Robert E. Farmes, Thief River Falls - Ground transects totaling 306 miles were run in Area IV, and counts were made on the following specific areas: Lower Twin Lake, Kittson County, Thief Lake and ditches on north side, Marshall County; Canvasback Pothole, Mahnomen County; and 15 potholes in Mahnomen and Polk Counties. When ground transect data were summarized, there were 3.42 water areas per square mile in 1952 compared with 5.22 in 1951. Occupancy was 21.4 percent this year compared with 13.7 percent last year. The number of pairs tallied per square mile was slightly higher than last year, 1.33 compared with 1.18. However, the number of ducks per square mile was slightly less than last year, 2.2 compared with 2.38 for 1951. An increase of 75 percent in the number of breeding pairs was recorded on Thief Lake this year. Forty-two pairs of ducks were noted along North Patrol Road ditches on Thief Lake compared with 24 pairs last year. Thirty-eight pairs were noted in the Mahnomen and Polk County Pothole study area compared with 7 last year. Blue-winged teal have been the "No. 1" breeding bird in Area IV in both years. Mallards were again in second place, the third place spot held by ringnecks last year was taken over by redheads this spring. Coots showed a slight increase, but are still way down from the 1950 count. Brood counts were made on 8 specific areas. These areas are Florian Slough, Thief Lake and Thief Lake Ditches, Marshall County;

Lower Twin Lake, Kittson County; Goose Lake, Pennington County; Canvasback Pothole and Warren Lake, Mahnomen County; and the pothole study area in Mahnomen and Polk Counties. A total of 126 Class "A" broods, totaling 901 young was tallied, giving an average brood size of 7.2. In 1951, 122 Class "A" broods averaged 7.6. Hatching began quite early with several large broods observed the last week in May. Weather conditions for the most part were considered good. Exceptionally dry weather in April and May caused some potholes to dry up, but several rains in the latter half of June brought water levels up to nearly normal. It is believed that the June rains in this area were not severe enough to cause flooding of nests. The dry conditions may have had some effect on broods on the smaller potholes, but should not have materially effected production on the more permanent areas. However, this year only 62 broods were seen on 5 areas compared with 130 broods last year. Thief Lake had more broods, but a sharp drop was noted on the other four. Thus, these counts showed production to be down about 50 percent unless a late hatch occurred, and the brood data point to a continuation of hatching after the time of the counts. When all the brood data collected from July 5 to July 10 are examined, the distribution by age class is as follows: Class I, 70 broods; Class II, 40 broods; Class III, 17 broods. The predominance of Class I broods indicates that considerable hatching was occurring at the time of the counts. A visit to Twin Lakes, Kittson County, during the last week of July revealed some Class I and many Class II broods that probably were not hatched at the time of the brood count on July 8. The number of blue-winged teal broods was down somewhat this year.

Area V - Norman J. Ordal, Fergus Falls - Ground transects totaling 276 miles were run in Area V from May 9 to May 14. At this time the area was undergoing a dry period. Most of the temporary, or D Areas, had been eliminated by the drought and some of those recorded in this classification were almost dry. The summary of transect data shows that there were 4.12 water areas per square mile compared with 5.66 last year. Occupancy was 28.9 percent compared with 13.3 percent last year. The number of pairs per square mile was 2.1 in 1952 and 1.31 in 1951. An increase was also shown in the number of ducks per square mile which was 4.15 compared with 3.02. General impressions on spring breeding populations are that blue-winged teal are somewhat more numerous this year and pintails have shown a marked increase. Mallards are about the same or somewhat more numerous. Redheads appear to be less numerous although the survey shows an increase. Brood counts were made on potholes of Becker, Otter Tail, Grant, and Douglas Counties and on one large lake - Lightening Lake, Otter Tail County. A total of 61 Class "A" broods, containing 500 young, was tallied, giving an average of 8.2 young per brood. The 1951 average for this area was 8.5 and for 1950 it was 7.7. The broods were distributed by age class as follows: Class I, 20 broods; Class II, 31 broods; Class III, 10 broods. The average size for all classes was 8.2 indicating a successful hatching season. The count on selected areas was lower than last year. The most striking example was Lightening Lake, on which more than 12 broods of various species were recorded in 1951, while only one brood was observed with the same coverage in 1952. Similar but less drastic decreases prevailed on Bergerud and Halvorson Ponds and other areas. It was judged that these decreases on specific areas could be attributed to a considerable extent to higher prevailing water levels, caused in part by the heavy rainfall in late June and early July. The Area V Biologist expressed his opinion of waterfowl production success in his area as follows: In view of the fact that breeding pairs were more numerous, the nesting season was favorable, and brood sizes were comparatively large; waterfowl production in Area V in 1952 will be, in my opinion relatively high and comparable to but somewhat higher than in 1951.

Area VI - John L. Zorichak, Brainerd - Since piloting for the aerial portion of the spring waterfowl breeding ground survey engaged the area game biologist for most of the month of May, he was not able to run any ground transects. However, in his driving about the area subsequent to May 20, it was discovered that resident waterfowl were present in comparatively large numbers. Ducks were observed in practically all types of aquatic habitat - from temporary field puddles to permanent open water. No extensive surveys were made of the situation, but sufficient data were recorded to formulate a reliable appraisal of the waterfowl breeding population. Mallards were most often recorded, with blue-winged teal a close second. Ringnecks were also commonly seen, both as paired ducks and in small flocks up to ten birds. Pintails, shovelers, wood ducks, and redheads occurred in about that sequence. Coots, though present, were not as abundant as in 1951, and redheads too appeared to be down. Numerous unsolicited comments and observations from qualified observers relative to the increase in local waterfowl production substantiated the area game biologist's conclusions in this regard. Brood counts were made on Graham Meadows, Russell Lake, and Gateway Slough, all in Crow Wing County. From these counts and miscellaneous observations, data were obtained on 33 Class "A" broods containing 306 young. This gives an average brood size of 9.3. Water levels and brood conditions were generally favorable until around July 16, after which time severe thunderstorms accompanied by heavy rains raised water levels considerably above normal for this time of year. Some flooding out of late nests might have occurred. The first brood record for the spring was a mallard brood seen on May 16. Some of the mallard and blue-winged teal broods seen earlier in the spring were not noted in these areas at the time of the brood counts, July 7 and 8.

Area VII - Walter H. Petraborg, Aitkin - Canoe transects were run on three of the major waterfowl breeding areas of Area VII. These are: Big Rice Lake, Cass County; Rice Lake Federal Refuge, Aitkin County; and Lake Onamia, Mille Lacs County. At Big Rice Lake, 43 pairs and a total of 186 ducks were counted along 10 miles of shoreline, giving an average of 4.3 pairs per mile of shoreline. This average for 1950 was 4.8 and in 1949 it was 5.5. Ducks per mile of shoreline were 18.6 compared with 12.5 for 1950 and 12.3 for 1949. These data indicate a good breeding population for Big Rice Lake this year. Thirteen miles of shoreline were covered at the Rice Lake Federal Refuge in Aitkin County. Totals of 78 pairs and 196 ducks were counted. The pairs per mile of shoreline figure is 6 compared with 7.7 in 1951 and 7.7 in 1949. Ducks per mile of shoreline were 15 compared with 15.9 in 1951 and 27.2 in 1949. The uniform pairs per mile of shoreline figures indicate a rather constant breeding population for this area. Baldpates have increased steadily over the past 3 years on the Rice Lake Federal Refuge. This lake is the main baldpate breeding place in Area VII. A low count was obtained at Lake Onamia, Mille Lacs County, due to winds that came up when the transect was being run. Ringnecks are rapidly becoming the No. 1 duck in numbers in Area VII. Mallards do not show up on the canoe transects as well as they should, due to early nesting away from the lake shore and nesting in small water areas in the woods. Wood duck numbers are high, however, only a few are seen on the lakes during canoe transects. Brood counts were made on Laura Lake and Big Rice Lakes, Cass County; Lake Onamia, Mille Lacs County; and the Rice Lake Federal Refuge, Aitkin County. Water levels for these lakes were low and aquatic growth heavy. The heavy growth of wild rice on all areas made brood counts difficult. Weather conditions were good with much dry weather until July. Broods appeared early this spring and the broods were large; however, the counts of broods on these four lakes were lower this year than last. The numbers of ducks were about the same as last year which may indicate that

some of the broods were not seen or that nesting was a failure in many instances. Fifteen Class "A" broods totaled 90 young, giving an average brood size of 6. The 1951 average brood size for this area was 8.

Area VIII - Forrest B. Lee, St. Paul - The area game biologist spent most of the month of May on the aerial breeding ground survey. However, subsequent to May 20, he drove the auto transects in Meeker and McLeod Counties. Water conditions were good along this route and a good number of breeding waterfowl was recorded. This year there were 4.5 water areas per square mile compared with 3.1 last year. Pairs per square mile were 3.04 compared with 1.46 last year. Ducks per square mile were 3.91 compared with 2.91 in 1951. A good normal population of breeding waterfowl was present this spring in Area VIII in slightly larger numbers than last year. Brood counts were made on Schillings and Washington Lakes, Sibley County; Grass Lake, McLeod County; Pelican Lake, Wright County; and the Carlos Avery Refuge. The average brood size was 7.1 based on 35 Class "A" broods containing 249 young. The 1951 average brood size was 9.8 and for 1950 it was 7.2. Water and weather conditions were favorable this spring and a good breeding population was noted. The severe rainstorms of late June and early July probably inflicted some mortality on young ducks. This is reflected in the low average size of Class I broods, 5.5. Class II broods averaged 8.1 young per brood and Class III broods averaged 5.7. In spite of any such loss, waterfowl production appeared to be high in Area VIII this year.

Area IX - Robert I. Benson, Glenwood - Auto transects totaling 140 miles were run again this year. Some slight variations were necessary due to high water over roads. When all the transect data for Area IX are summarized, the number of water areas tallied per square mile was essentially the same as last year, 6.6 compared with 6.9. The percent of occupancy was considerably higher this year, 46.1 percent compared with 32 percent. The number of pairs per square mile was approximately the same, 3.43 compared with 3.34. However, the total number of ducks was larger this year, 8.29 compared with 6.37. The unpaired ducks on the transects were mostly redheads and ruddy ducks, some of which no doubt later paired up and established breeding territories. The preceding data would indicate a small increase in the breeding population of Area IX. A very definite increase was noted in the case of coots. This year 205 were tallied compared with 25 last spring. Brood counts were made on Lake Simon, Pope County; Ringo Lake, Kandiyohi County; and Gorder Lake, Stevens County. Counts were also made in the pothole study areas of Pope, Big Stone, and Swift Counties. Data were collected on 40 Class "A" broods totaling 314 young. This gives an average brood size of 7.9 compared with 7.5 in 1951. Comparisons of last year's data with this year's counts on the three mentioned lakes and the Pope County pothole study area show similar counts. Twelve broods were observed on these areas this year compared with 11 in 1951. There was a decided increase in the breeding coot population and the hatch was very successful. The blue-winged teal was as usual the most common breeding duck in the area with numbers seeming to be about the same as last year. Redheads have increased. The ruddy duck population continues the climb of recent years.

Area X - Gerald T. Bue, Marshall - A total of 243 miles of auto transect route was run in this area. The transects were driven by LeRoy Angell, since the area biologist was engaged as an observer for the aerial survey. When total transects are considered, there were 1.5 water areas per square mile compared with 1.3 last year. These figures indicate little change in the number of water areas. Occupancy was somewhat higher this year, 36.6 percent compared with 32.0 percent.

An increase was shown in the number of pairs per square mile and in the total number of ducks per square mile. The number of pairs per square mile was 1.2 compared with .61 and the number of ducks per square mile was 2.25 compared with 1.27 in 1951. A substantial increase was noted for coots on the transect routes, 219 were tallied compared with 32 in 1951. Brood counts were made on Hawk's Nest Lake, Lincoln County; Wood Lake, Lyon County; and Badger and Iron Lakes, Murray County. Data on 39 Class "A" broods give an average of 8.3 young per brood. The 1951 average was 7.6 and in 1950 it was 7.6. More broods than last year were found on Hawk's Nest Lake and at Wood Lake; the number of broods was essentially the same. The age class distribution of 49 broods observed from July 1 to July 9 is as follows: Class I, 15; Class II, 21; Class III, 13. This distribution would indicate that hatching began early and continued uniformly up to the time of the brood counts. In regard to broods, redheads were definitely more numerous again this year. Mallards were slightly less abundant. Blue-winged teal were not more abundant than last year and may have been down slightly. Pintails were about as numerous as in previous years. Coots were definitely more abundant this year, young being seen in good numbers all over the area. Water levels were high this year and the adult population appeared to be larger than last season. Many of the small water areas were occupied this year which were not used last year or the year before. The population on the main bodies of water was as large as or larger than the past two seasons, too, so a considerably greater production was anticipated for Area X.

Area XI - Donald H. Ledin, Fairmont - Ground transects totaling 210 miles were run in Area XI. This year there were 3.1 water areas per square mile compared with 2.8 in 1951. Occupancy was 17.1 percent compared with 12.1 percent. Pairs per square mile were 1.28 compared with .44 last year. Ducks per square mile were 1.56 compared with .61 last spring. An increase was noted in the number of coots tallied; 27 were recorded compared with 12 last year. Brood counts were made on Swan Lake, Nicollet County; Silver Lake, LeSueur County; Walnut Lake Area, Faribault County; Lower Twin Lake and Upper Twin Lake, Freeborn County. Data on 25 Class "A" broods give an average brood size of 7.4 compared with 8.5 last year and 8.1 in 1950. Most broods were quite young, the age class distribution being as follows: Class I, 13 broods; Class II, 9 broods; Class III, 3 broods. The Class III broods averaged 10.7 young. The Class II average was 7.1, and for Class I it was 6.8. The rather small brood size average for Class I broods might indicate that some loss was inflicted by the storms of late June and early July.

Area XII - William H. Longley, Kasson - Ground transects totaling 100 miles were run in Rice and Steele Counties. There were 4.7 water areas this year compared with 3.4 last spring. An increase is noted in the number of pairs per square mile which was 1.72 compared with 1.12 in 1951 and 1.2 in 1950. A greater increase is shown by the ducks per square mile figure which was 3.16 this year and 1.76 for both 1950 and 1951. Forty-seven coots were counted along the route compared with none last year and 23 in 1950. Brood counts were made on Rice Lake, Dodge County; Oak Glen Lake, Steele County; and the Weaver Marshes and Whitewater Springs, Wabasha County. Nine broods were seen on Oak Glen Lake compared with 14 last year. Some adult and paired ducks were on this lake. High water persisted up to June in the Weaver Marshes and Whitewater Springs area, covering some of the better shoreline. This may have caused some waterfowl to leave the area or may have delayed nesting. The Class "A" broods observed on these counts were large, averaging 10.1 young per brood. The 1951 average was 8 and for 1950 is was 7.6.

Waterfowl Banding

A total of 489 waterfowl was banded from July 22 to August 4 in Areas III and VI. All banding was of flightless young or adults. Waterfowl were banded by species as follows: blue-winged teal, 207; ring-necked ducks, 99; redhead, 38; mallard, 33; baldpate, 30; canvasback, 21; green-winged teal, 20; pintail, 12; shoveler, 8; gadwall, 3; and coot, 18.

WATERFOWL BREEDING GROUND SURVEYS IN MICHIGAN

Herbert J. Miller

Introduction

Personnel of the Michigan Department of Conservation have repeated the surveys that have been carried on for the past five years to determine production of waterfowl. In addition, an extensive aerial survey was made as a pilot study to obtain an index of breeding pairs for the entire State, and a more limited aerial brood survey was also conducted.

Methods of Sampling

Dense cover and extensive forested areas dotted with permanent lakes, swales, and beaver ponds, and traversed by a multitude of streams, typify the habitat to be censused in Michigan. Breeding birds are scattered and difficult to locate. Experience has demonstrated that under these conditions there are limitations to the accurate determination of waterfowl production. In view of these limitations, efforts were extented to obtain comparative indexes through three types of surveys:

1. Spring migration observations.
2. Potential breeding population surveys.
3. Brood censuses.

For each of the three types of survey, aerial censuses (both extensive and on sample check areas) were carried on together with ground surveys by District Game Biologists. The sample check areas were carefully selected several years ago and the same survey techniques have been applied each year to provide an index of change. Standard methods of censusing were used. Locations of the sample check areas and the extensive aerial transects are shown on the map (Figure 1.).

Breeding Population Trends

The movement of migrants through Michigan this spring appeared to progress at an accelerated pace due to an early break-up of ice and the prolonged periods of high temperatures which occurred throughout the month of April. The U. S. Weather Bureau reported mean temperatures of April as 3.4° warmer than average.

The number of migrants returning to their nesting grounds through Michigan showed a slight increase, judging from observations throughout the State.

Interviews with 119 selected observers indicated a favorable trend. These observers, scattered throughout the State, are contacted each year. More than 50 percent of these observers believed that there were more migrants this spring compared to last year or two years ago:

	Percent	Dabblers	Divers	Geese	All Species
Opinions on numbers compared to the previous spring (1951)	More	44	60	63	50
	Same	43	31	28	38
	Fewer	7	9	4	7

	Percent	Dabblers	Divers	Geese	All Species
Opinions on numbers compared to the spring of 1950.	More	67	76	68	70
	Same	24	18	27	23
	Fewer	9	6	5	7

Observations by sixteen District Game Biologists checking sample areas support the opinions of these selected observers. A summary of the District Game Biologists' observations indicate that 55 percent of the sample areas had more waterfowl, 31 percent showed little change, and 13 percent had fewer migrants as compared to the previous year.

Aerial censuses of spring migrants on three major concentration areas, Saginaw Bay, Lake St. Clair, and Lake Erie showed no appreciable change in numbers compared to 1951. Although the "count-estimates" on these three areas do not support the more optimistic observations from other parts of the State, it should be noted that accelerated migration this spring reduced the chances for large build-ups of waterfowl at these major concentration points. One particular species that has shown a marked increase in numbers during the spring migration in recent years is the whistling swan.

Potential Breeding Population Surveys

Aerial censuses on two sample check areas were repeated for the fifth consecutive year to provide a comparison of the potential nesting population of southern Michigan farm land habitat. One area is in Barry County; the other extends through parts of Ingham, Livingston, and Oakland Counties. The Barry County area figure is comparable to that of 1950, but lower than in 1951. The other sample check area showed an increase over the past four years.

(Aerial Surveys)

Year	Ducks per Lineal Mile Barry County *	Ducks per Lineal Mile - Ingham, Livingston, and Oakland Counties**
1948	0.10	0.55
1949	0.37	0.68
1950	0.16	0.79
1951	0.21	0.78
1952	0.16	1.00

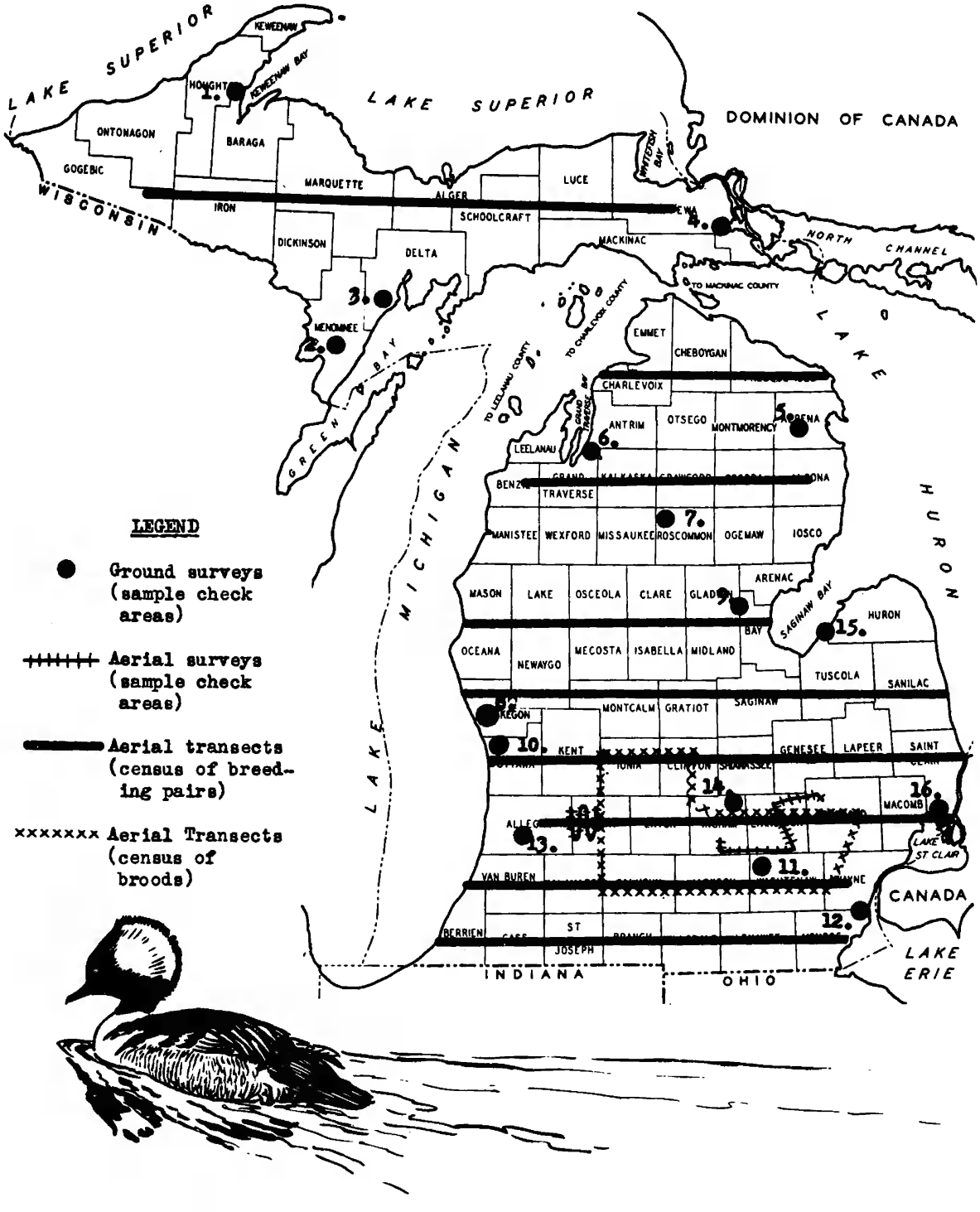
* A total of 300 lineal miles censused.
** A total of 72 lineal miles censused.

Only locally nesting species are included in the potential nesting population. Diving ducks not known to nest in this area were excluded.

The potential breeding population figures shown above may be converted to birds per square mile by multiplying by 2, as each lineal census strip was one-half mile in width, one-quarter mile on each side of the plane.

Ground checks made by District Game Biologists, on sample check areas, scattered throughout the State showed a high population of breeding pairs. These

Figure 1. - WATERFOWL BREEDING GROUND SURVEYS
MICHIGAN - 1952



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sample check areas represent the better types of habitat within their respective locations in the State. The censuses were made by boat over established routes:

(Boat Surveys)

Year	Lineal miles censused	Potential breeders per lineal mile
1949	85	6.80
1950	81	7.91
1951	120	8.18
1952	82	7.13

Judging from this information, Michigan had a good population of potential breeding stock, approximately equal to the four-year average. Production during each of these years was considered good.

In addition to the previously conducted surveys to determine potential breeding populations a "pilot study" was made to test the aerial transect method advocated by the U. S. Fish and Wildlife Service. The objective of this technique is to obtain a quantitative population index of breeding pairs per square mile for each of the four major biotic zones (strata) of the State.

This type of survey has proven successful in the Prairie Provinces and with some modifications has been used with a fair degree of success in the Eastern Seaboard States and Maritime Provinces. Since habitat conditions in Michigan are somewhat similar to those in some of the Eastern States, an attempt to use the method appears justified.

In cooperation with Fish and Wildlife Service personnel a sampling plan was worked out that provided for an optimum sampling ratio based on the best available information. This plan was executed and the results are summarized in Figure 2.

The results were not entirely satisfactory but from the experience gained through this "pilot study" we believe that with modifications, this technique may be applied to limited portions of the State to obtain indexes of breeding populations. The low index values shown for the northern half of the State suggest that further aerial censuses may not be justified.

Nesting Conditions

Weather conditions were favorable during the nesting period. May temperatures were normal with precipitation slightly below average. In June, temperatures were above normal. Precipitation was above average in the northern half of the State and below average in the south. With the exception of a border of habitat along the Great Lakes shoreline, nesting conditions in Michigan appeared to be favorable for a successful hatch.

Along the Great Lakes, former nesting habitat has been inundated as a result of extremely high water levels. The net effect of this flooding is not entirely clear, but field observations and the results of brood studies indicate that production in general has not been seriously hampered.

Success of the Season

After the ground surveys to determine potential breeding populations, brood censuses were made on the same sample check areas to measure nesting success. Information obtained from these brood censuses can be used only as an index of production, since many broods go unobserved in the dense cover typical of our marshes.

Comparing the brood census figures with those obtained in previous years indicates that production was good. The number of broods per lineal mile of census line was the highest in four years. The average size of the broods, however, dropped slightly by comparison to the previous years, but the average of 4.6 young per hen is still considered a good survival ratio. Comparisons are shown below:

Year	Broods per lineal mile	Hen and young per lineal mile	Bachelor ducks per lineal mile	Average size of broods observed
1949	.47	2.75	6.50	6.00
1950	.34	2.32	5.50	5.87
1951	.35	2.20	3.31	5.76
1952	.70	3.92	3.21	4.60

As a follow-up on the aerial transects of potential breeders, another pilot study was run. A portion of Stratum No. 1 was flown to census broods with results as follows:

Area in square miles	16,107
Lineal miles censused	272
Square miles censused (one-quarter mile strip censused, one-eighth mile on each side of plane)	34
Broods per square mile	.147
Hens and young per square mile	.588
Young per square mile	.514
Adults without broods	.176

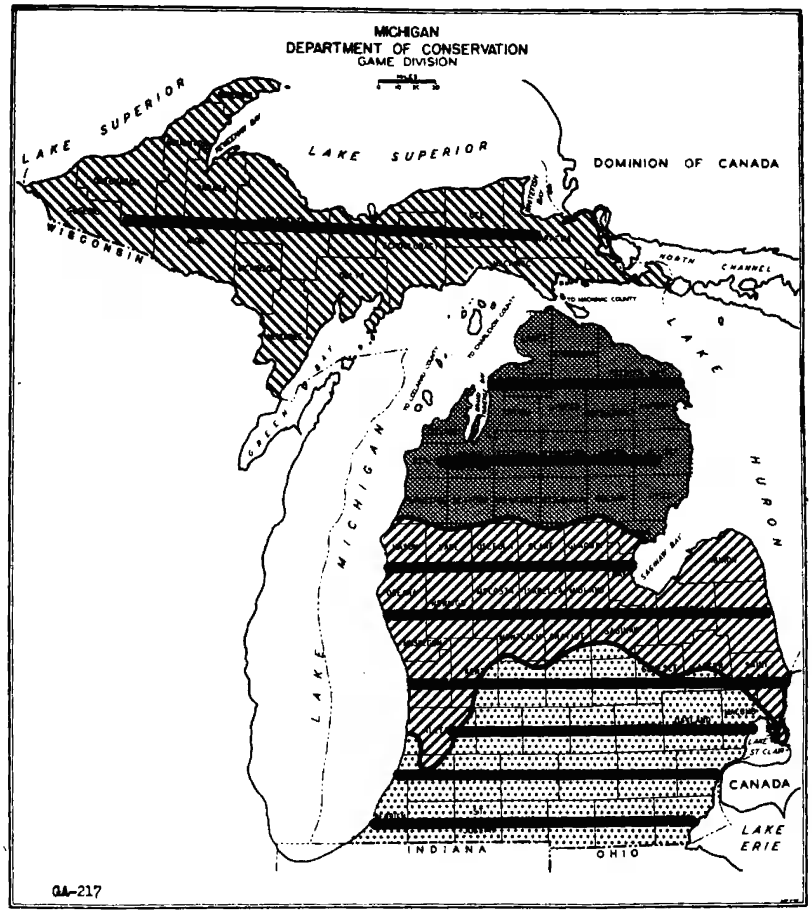
The low values obtained by random sample aerial census technique indicate that it may be desirable to apply aerial brood surveys only on known waterfowl concentration areas such as river systems, chains of lakes, or similar situations. In this way, sufficient numbers of birds may be obtained to provide statistically significant figures to be used for comparative indexes.

Summary

1. Observations by selected observers and by our District Game Biologists on sample check areas indicated an increase in the numbers of waterfowl migrating to the nesting grounds through Michigan. Comparative aerial observations (count estimates) of waterfowl on three major concentration areas indicated no change in numbers.

2. Surveys to determine potential breeding populations indicate breeding pairs approximately equal to the average of the past four years.

Figure 2 - AERIAL BREEDING PAIR SURVEY IN MICHIGAN - 1952



L E G E N D

Strata Number		Area in sq. mi.	Lin. mi. sampled
	1	16,107	620
	2	13,750	380
	3	12,253	195
	4	16,107	210
		58,217	1,405

Aerial Transects

Strata Number	Potential nesting ducks	Non-nesting species	Nesting ducks per lin. mi.	Nesting ducks per sq. mi.	Water Areas
1	147	39	.237	.474	845
2	128	44	.336	.673	482
3	2	8	.010	.020	74
4	12	0	.157	.114	113
	289	91	.205	.411	1,514

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3. Nesting conditions were considered favorable for production in Michigan.

4. An increase in the numbers of broods on sample areas, together with a good survival rate in the broods, strongly indicates that production was comparable to or slightly better than the past three year average. Each of the three preceding years was considered to be years of good production.

WATERFOWL BREEDING GROUND SURVEY IN INDIANA

James D. McCall

Introduction

A waterfowl breeding ground survey was conducted again this year by the Indiana Department of Conservation, through its Pittman-Robertson Wildlife Research Project. Thirteen study areas and eight river transects were re-studied to obtain trends on both breeding populations and brood production. In addition a few exploratory surveys were conducted.

The census techniques were essentially the same as those described in the 1951 report.

Weather and Water Conditions

State-wide temperature and precipitation were normal during April and May. June averaged 5° F., and 0.88 inches above normal. Weather conditions, migration, and nesting were about two weeks earlier than last year.

The water level in potholes was maintained at normal to above normal through mid-July. By mid-August many of the shallow potholes had gone dry. Losses from fluctuating water levels were not observed and were believed to be small, if any. In general, conditions have been favorable for waterfowl breeding in Indiana this year.

Breeding Population Trends

It has become increasingly apparent that it is impossible to make a pre-brood census without encountering many migrant birds involving several species that do not normally nest in Indiana. It is also apparent that the 3 species most frequently observed nesting within the State have definite habitat preferences.

Under our present census methods, 95 percent of the wood duck broods observed are produced on rivers, while mallards and blue-winged teal show an equally high preference to potholes for rearing young. It is, therefore, believed that the breeding population should be considered only in the habitat characterized by species utilization.

The calculated breeding pairs, according to habitat, indicate an increase in wood ducks and mallards, while blue-winged teal show a decrease (see Table I).

Within the past three years, broods have been recorded for the following species: wood duck, mallard, blue-winged teal, black duck, hooded merganser, lesser scaup, Canada goose, coot, and Florida gallinule. Coverage has been insufficient to present trend information on the latter six species, but it is believed that their production in this State has little affect on the flyway population.

The breeding population trend studies cover the period from April 22 to May 24, 1952.

Table I - Comparison of Calculated Total Pairs of Three Common Species of Breeding Waterfowl, According to Habitat - Indiana, 1951-1952

	Calculated No. Pairs		Percent Change
	1951	1952	1952
RIVERS			
Wood duck	103	124	+ 20
POTHOLES			
Mallard	22	28	+ 27
Blue-winged teal	22	21	- 5
Total	147	173	+ 18

Table II - Production Trends on 106 Linear Miles of River Transects and 13 Pothole Study Areas - Indiana

Species	No. Broods		No. Young		Percent Brood Change - 1952
	1951	1952	1951	1952	
Mallard	5	10	19	53	+ 100
Black duck	0	1	0	8	
Blue-winged teal	4	2	30	10	- 50
Wood duck	73	79	452	516	+ 8
Lesser scaup	0	1	0	6	
Total	82	93	501	593	+ 13

Success of the Season

Comparative brood data were gathered from May 28 to July 1, 1952. In total, 93 broods were observed this year, whereas only 82 broods were seen in 1951 (see Table II). Increases were recorded for wood ducks and mallards, while blue-winged teal showed a decrease in brood production. These brood trends correlate somewhat with the breeding population discussed earlier in this report. However, the correlation by species is more uniform when considered only in their major habitat (see Table III). In considering all species throughout the State, there was a 14 percent increase in brood production.

The average size of individual broods, according to age class, shows an increase in all species recorded in 1951; the one exception being wood ducks of the second age class (see Table IV).

On all comparable areas, 1951 counts totaled 82 broods or 501 young, and in 1952, a total of 93 broods involved 593 young. More partial counts were obtained in 1952 and the young were somewhat older, yet more young were seen. This further substantiates greater rearing success this year.

Table III - Brood Comparison of Three Common Species of Ducks According to Habitat Utilization, Indiana -- 1951-1952

	Number of Broods 1951	1952	Percent Change 1952
RIVERS			
Wood duck	68	77	+ 13
POTHOLES			
Mallard	5	9	+ 80
Blue-winged teal	4	2	- 50
Total	77	88	+ 14

In considering all species encountered, 106 miles of river transects averaged 0.64 broods per linear mile in 1951 and 0.74 broods in 1952. On the 13 pothole study areas, representing 14 square miles, the production averaged one brood per square mile each year.

Table IV - Comparison of 1951-1952 Waterfowl Brood Counts * By Species and Age Class, All Observations - Indiana

Species	No. Broods Age Class I	II	III	No. Observed Age Class I	II	III	Brood Average Age Class I	II	III	Total Broods	Total Average
				MAY 7 to JULY 26, 1951							
Mallard	1	-	9	4	-	40	4.0	-	4.4	10	4.4
B-w. teal	-	4	1	-	31	5	-	7.8	5.0	5	7.2
Wood duck	63	13	6	455	92	34	7.2	7.1	5.7	82	7.1
Hooded merganser	-	-	1	-	-	7	-	-	7.0	1	7.0
Canada geese	2	-	-	8	-	-	4.0	-	-	2	4.0
Total										100	6.8
				MAY 21 to JULY 25, 1952							
Mallard	6	9	4	49	58	21	8.2	6.4	5.3	19	6.7
Black duck	-	1	4	-	6	28	-	6.0	7.0	5	6.8
B-w. teal	3	1	3	30	11	21	10.0	11.0	7.0	7	8.9
Wood duck	62	40	12	471	257	79	7.6	6.4	6.6	114	7.1
Hooded merganser	-	2	-	-	22	-	-	11.0	-	2	11.0
Canada geese	6	1	-	28	5	-	4.7	5.0	-	7	4.7
Total										154	7.0

* Only whole counts are included in this table.

Summary

Water levels in the pothole area of northern Indiana have been favorable for both nesting and rearing of young.

Calculated breeding pairs and brood trends, according to habitat preference, appeared to be correlated as increases were recorded for wood ducks and mallards, while blue-winged teal showed a decrease. The average for all species indicate a 14 percent increase in brood production this year. This increase amounted to 11 more broods and 92 more young ducks.

The average brood size for all species and all age classes increased from 6.8 in 1951 to 7.0 in 1952.

Trapping and banding was not initiated until September.

WATERFOWL BREEDING GROUND SURVEY IN OHIO

Delmar Handley

Introduction

Up until 1952 only sporadic attempts, mostly in the form of specialized studies, had been made by both private individuals and the Ohio Division of Wildlife to gather and evaluate data on waterfowl in Ohio. However, on June 1, 1952 the Ohio Division of Wildlife initiated a Pittman-Robertson waterfowl research project (W 70-R) to make an over-all waterfowl survey including breeding ground surveys, migration and wintering ground surveys, banding, habitat inventory as well as other specialized waterfowl studies.

Methods of Sampling and Area Covered

The Division of Wildlife has, for administrative purposes, divided the State of Ohio into six wildlife management districts. District number one is concerned only with commercial fishing in Lake Erie. The remaining five districts consist of approximately eighteen counties per district. The personnel of each district consists of, among others, a game management supervisor and an assistant whose duties consist working almost entirely with game animals. It is these men who will hereafter conduct the major portion of the field work involved in making the breeding ground surveys. The leader of project W 70-R will tabulate, analyze, and report these data along with data accumulated on specialized waterfowl projects.

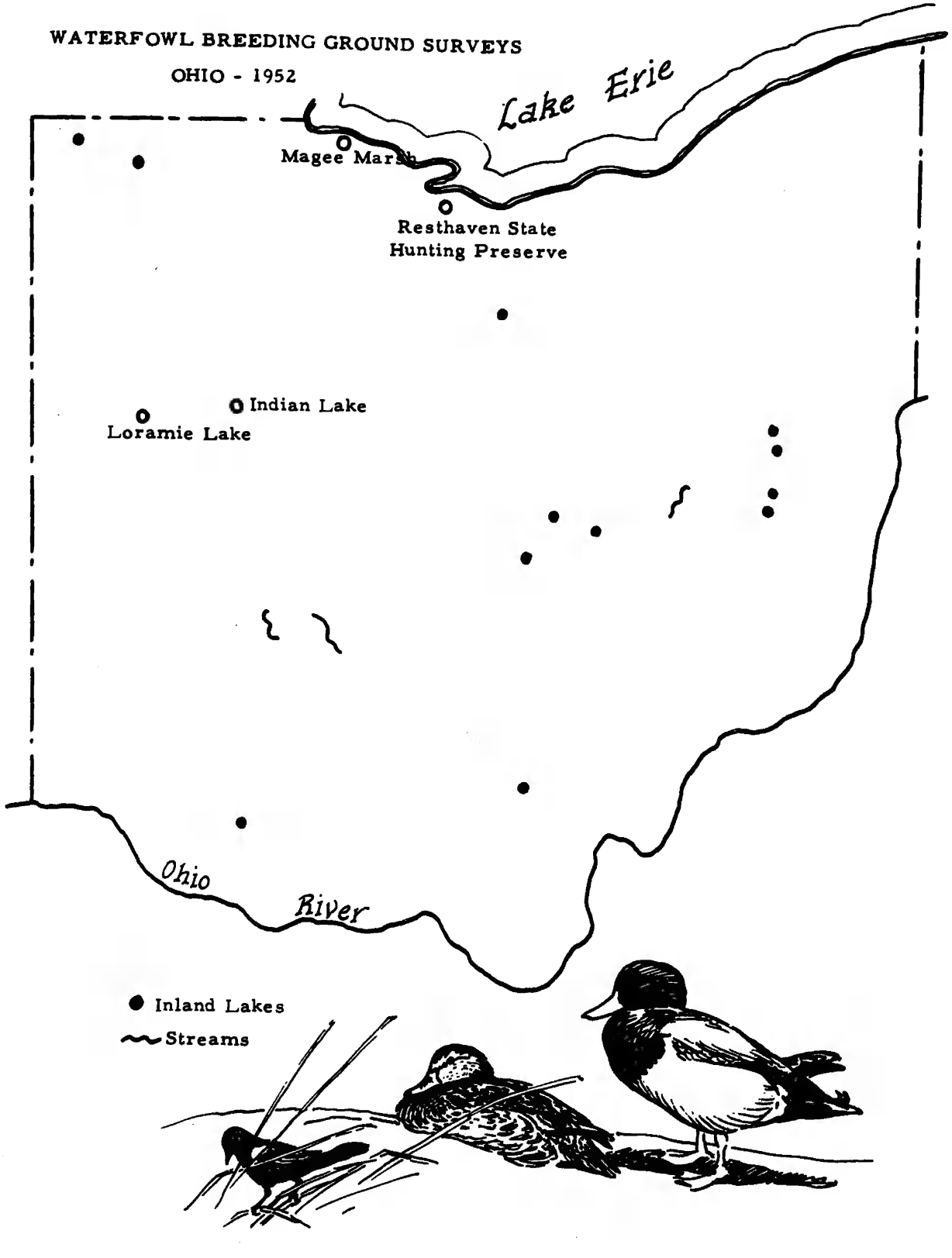
Due to the fact that the waterfowl project did not get underway until June 1, there was no attempt by the district personnel to obtain any data on breeding pairs. In the brood surveys, each district was instructed to work as many water areas as possible with major emphasis being placed on the large inland lakes. Water areas were to be chosen that could be worked each year with the same methods in order to obtain comparable data.

The water areas were to be covered by travelling completely around the shoreline in a boat and recording all of the broods that could be discovered with the aid of binoculars. These areas were to be worked only from dawn until 8:00 a.m. and from 5:00 p.m. until approximately dusk. Two coverages were to be made, one the second week of June and the other one the second week in July.

In addition to the brood surveys conducted by the district personnel there were specialized waterfowl projects being carried on at the State-owned Magee Marsh, the Resthaven State Hunting Preserve and at Indian and Loramie Lakes.

The study at the Resthaven State Hunting Preserve is an over-all year round study of waterfowl as part of a P-R project (61-R) set up to study the populations and production of both upland game and waterfowl on this area. The census methods used are as outlined in Special Scientific Report: Wildlife No. 13.

The study at Indian and Loramie Lakes, which are old reservoir lakes, is an intensified brood production study with one man spending three days a week from June 15 to July 19 at each lake searching the entire water areas by boat for broods. A similar intensified brood study was conducted on Indian Lake during the previous summer.


WATERFOWL BREEDING GROUND SURVEYS
OHIO - 1952
Lake Erie
Magee Marsh
Resthaven State
Hunting Preserve
Indian Lake
Loramie Lake
Ohio River
Inland Lakes
Streams

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The Magee Marsh, which was acquired during 1952 by the Chio Division of Wildlife for public waterfowl shooting, is a portion of the Lake Erie Marshes. During the spring of 1952 Karl Bednarik, the manager of this area conducted a breeding ground survey which was later followed up by nesting checks and brood surveys. The brood surveys were conducted by the use of a boat and by walking the dikes which traverse the area. Broods were recorded and followed throughout the spring and summer to determine brood decimation.

Weather and Water Conditions

Weather conditions throughout the spring of 1952 encouraged a normal movement of waterfowl through the State. However, nesting was approximately two weeks earlier than last year with the majority of the nesting being well underway by the first week in May. Two broods, one mallard and one black duck were discovered to have hatched at the Resthaven State Hunting Preserve on April 25.

Water conditions were generally favorable in the inland lakes and streams for waterfowl production. However, there was a considerable reduction of available duck nesting habitat in the Lake Erie Marshes due to a rise of approximately two feet in the mean level of Lake Erie during the spring and early summer of 1952.

Success of the Season

Due to the fact that the over-all waterfowl program was not initiated until 1952 there is very little data available to compare between the 1951 and 1952 seasons. Data compiled at Indian Lake and at the Resthaven State Hunting Preserve indicate only a slight change during 1952 in the total number of broods and young produced with a slight increase in the average brood sizes.

The following tables and map summarize the data for 1952:

Table I - District Brood Survey Data

* Date of Coverage	June 15 - 22
Acres of Lake Censused	10,045
No. of Broods Observed	30
Broods per Square Mile	1.9
Miles of Stream	17
No. of Broods	19
Broods per Mile of Stream	1.1

*Data from first coverage only - Second coverage incomplete.

Table II - District Brood Survey Data from Inland Lakes by Species

Species	No. of Broods	Total Young	Young Per Brood	No. of Broods		
				Class I	Class II	Class III
Wood duck	28*	210	7.5	2	12	5
Mallard	2	12	6.0		2	
Total	30	222	6.8	2	14	5

*Nine of the wood duck broods were not aged.

Table III - District Brood Survey Data from Streams by Species

Species	No. of Broods	Total Young	Young per Brood	No. of Broods Class I	Class II	Class III
Wood duck	19	161	8.5	3	10	6

Table IV - Brood Surveys at Indian Lake (5,800 Acres)

Species	No. of Broods 1951	1952	Total Young 1951	1952	Young per Brd. 1951	1952	Broods Per Sq. Mile 1951	1952
Wood duck	19	19	149	127	7.8	6.7		
Mallard	7	6	61	53	8.7	8.8		
Black duck	1	2	8	11	8.0	5.5		
Total	27	27	218	191	8.2	7.0	2.9	2.9

Table V - Brood Surveys at Resthaven State Hunting Preserve (600 water acres)

Species	No. of Broods 1951	1952	Total Young 1951	1952	Young per Brood 1951	1952	Broods Per Sq. Mile 1951	1952
Mallard	10	7	50	51	5.0	7.3		
Black duck	3	5	16	42	5.3	8.4		
Wood duck	2	2	14	18	7.0	9.0		
Total	15	14	80	111	5.8	8.2	15	14

Table VI - Magee Marsh (1,960 Acres)

Species	No. of Broods	Total young	Young per Brood	Broods Per Sq. Mile
Mallard	7	40	5.7	
Black duck	3	23	7.7	
Wood duck	1	9	9.0	
Total	11	72	6.6	3.5

Table VII - Loramie Lake (1,650 Acres)

Species	No. of Broods	Total Young	Young Per Brood	Broods Per Sq. Mile
Wood duck	9	81	9.0	
Mallard	5	47	9.4	
Total	14	128	9.2	5.4

Table VIII - Results of Summer Waterfowl Banding Operations

Species	Adult Male	Juvenile Male	Adult Female	Juvenile Female	Total
Mallard	114	159	128	180	581
Black duck	46	107	34	87	274
B-w. teal	32	80	42	78	232
Black-Mallard	2	1	3	2	8
Pintail	2	3	1	2	8
Wood duck	1	2	-	2	5
Total	197	352	208	351	1,108

WATERFOWL BREEDING GROUND SURVEY IN CONNECTICUT

M. S. Belden

Introduction

Waterfowl breeding ground surveys were initiated in Connecticut during the spring of 1946 as a portion of the State's Pittman-Robertson project on the Estimation of Wildlife Populations. Basic work for these surveys was carried out during 1946 and 1947. Procedures and areas were modified and by 1948 the ground survey pattern was fairly well standardized. Chief emphasis has been placed on the brood or summer population survey as a means of determining waterfowl production trends. Data was collected until 1951 by ground coverage of selected areas. State-wide aerial transects were initiated in that year to supplement the ground information.

Ground counts have been conducted by R. S. Billard and the author, covering from 35 to 40 selected waterfowl areas. The size of these areas varies from 2 to 48 acres. Areas have been added from time to time during the course of the survey in an effort to round out the coverage.

The 1,288 miles of aerial transect lines which cross the State, have been flown by R. S. Billard since their inauguration in 1951.

Methods of Sampling

Ground Coverage

Two observers using two cars and a canoe cover as completely as possible selected waterfowl breeding areas. These include samples of the chief types of waterfowl breeding habitat within the State. Lakes, ponds, streams, rivers, upland and tidal marshes are represented.

Data is secured from observations made during June and July from one or a combination of the three following means:

1. Canoe or boat - Coverage of the area by water.

2. Car - Coverage of the area by the use of field glasses from a car parked along the shore over-looking a waterfowl breeding area.

3. Walking - Coverage by observation of an area by walking along the shore, or by using field glasses from selected points along the shore.

Aerial Coverage

The State, for the purpose of aerial brood counts, has been sub-divided into three major regions based primarily on cover differences. They are the following:

1. Northern Hardwood
2. Oak Chestnut
3. Tidal Marshes

These regions have been covered by transect lines laid out in the following manner:

1. Northern Hardwood Region

   Transect interval 3-1/2 miles, bearing true E & W, strip width 1/8-mile, length 192 miles in 24 8-mile sections, i.e. 24 square miles.

2. Oak Chestnut Region

   Transect interval, bearing and strip width as above. Length 1,032 miles in 129 8-mile sections, i.e. 129 square miles.

3. Tidal Marsh Region

   Transect intervals and bearing various, strip width 1/4-mile, length 64 miles in 16 4-mile sections, i.e. 16 square miles.

Coverage of the transects is made in both June and July to correspond to the ground survey.

Breeding Population Trends

Although data has been collected during both June and July the greater number of waterfowl have consistently been tabulated in July. It is from these July counts that yearly comparisons to date have been based. Five year records on duck populations are available for 35 of the 40 areas. These are summarized in the following table.

On a total duck seen basis, the five-year survey of the 35 comparable areas indicates a duck population high in 1952 and a low for the same during 1950. Wood duck lead in numbers until 1952 when for the first time the black ducks exceeded the wood ducks. Mallards have been recorded from time to time, but have made their strongest showing in 1952.

Weather and Water Conditions

Average temperatures in 1952 during March, April, May and June were generally above normal. Variations ranged from a minus nine-tenths of a degree in May to plus 4.4 degrees in June. The average for the spring period was 2.25° above normal.

Precipitation in April, May and June was well scattered and averaged 1.8 inches above normal. Ponds, lakes, and streams were thus provided with greater amounts of water and produced more areas suitable for waterfowl.

High temperatures and abundant water were apparently favorable to waterfowl in general and contributed to early and diversified nesting.

Table 1 - Connecticut Waterfowl Summer Population Count on 35 Areas - 1948 through 1952

	BLACK DUCK				WOOD DUCK				MALLARD				UNKNOWN			
Year	Brds.	Yg.	Adult	Total Seen	Brds.	Yg.	Adult	Total Seen	Brds.	Yg.	Adult	Total Seen	Brds.	Yg.	Adult	Total Seen
1948	9	28	133	161	22	40	177	217	1	2	-	2	7	15	19	34
1949	17	55	134	189	24	82	110	192								
1950	6	33	103	136	24	86	90	176	1	2	2	4	6	37	19	56
1951	7	33	162	195	31	156	160	311	2			2			2	2
1952	7	26	275	301	17	76	180	256	36			36	5	6	1	7

YEARLY TOTALS

Year	Broods	Young	Adult	Total Seen
1948	17	85	329	414
1949	41	137	244	381
1950	37	158	214	372
1951	38	184	326	510
1952	29	108	492	600

Success of the Season

Ground Survey

The number of waterfowl tallied on the 40 ground observation areas during the 1952 July census was 6.9 percent greater than that for 1951. The composition of the population also varied from that of 1951. This year for the first time during the summer surveys the black ducks exceeded the wood ducks in total numbers. Mallards also showed a decided increase in number. To substantiate the contention of earlier nesting in 1952, the total number of flying birds seen was 28 percent greater than in 1951. Along with this was a similar reduction in the number of juveniles tallied. A comparison of the 1951 and 1952 counts by species follows:

Table II - Connecticut Waterfowl Summer Population Count on 40 Areas (by species) 1951 and 1952

Species	Adult	Young	Total
Black duck			
1952	291	26	317
1951	217	33	250
Wood duck			
1952	208	86	294
1951	191	165	356
Mallard			
1952	42	-	42
1951	-	-	-
Unknown			
1952	1	9	10
1951	2	-	2
G-w. teal			
1952	2	-	2
1951	-	-	-
Canada geese			
1952	16	-	16
1951	-	-	-

Aerial Surveys

Aerial waterfowl data indicated a drop of approximately 36 percent in the State's 1952 total summer waterfowl populations. Computations based on the counts for both years is shown in Table III.

This drop is not compatible with ground survey data nor with any other appraisal of the waterfowl conditions within the State to date.

Table III - Summer Waterfowl Populations in Connecticut 1951 and 1952
(Based on Aerial Transects)

Regions	Adults	Broods	Young	Total	Total Per Sq. Mile
			1952		
Northern Hardwoods	553	110	662	1,215	.92
Oak Chestnut	4,505	255	1,275	5,780	1.6
Tidal Marsh	280	16	86	366	15.3
Total	5,338	381	2,023	7,361	
			1951		
Northern Hardwoods	3,423	165	442	3,865	2.9
Oak Chestnut	5,865	226	765	6,630	1.8
Tidal Marsh	1,064	3	6	1,070	44.6
Total	10,352	394	1,213	11,565	

Summary

Waterfowl breeding ground surveys were initiated in Connecticut in 1946.

Two types of surveys have been used; ground coverage of selected areas and aerial coverage using transects which cover the State.

Aerial surveys started in 1951 have presented difficulties which influence the validity of data collected and which as yet have not been ironed out.

Ground surveys which have been conducted for five years indicate:

1. The chief species of duck breeding in Connecticut to be Wood duck, Black duck and Mallard.
2. The importance of the Wood duck as a breeding duck in Connecticut, ranking first in numbers on the survey until 1952.
3. A recent increase in the number of Mallards breeding in Connecticut.
4. A rather spectacular increase in the Black duck population during the summer of 1952.
5. A low in summer waterfowl populations during 1950.
6. A high in summer waterfowl populations in 1952.

WATERFOWL BREEDING GROUND SURVEY IN SOUTHERN NEW JERSEY

F. V. Schmidt, P. D. McLain and F. Ferrigno

Introduction

The objectives of the breeding ground survey conducted in southern New Jersey during the spring and early summer of 1952 were as follows:

A. To gather data for the estimation of a production index by the aerial transect method,

B. To continue ground observations on the Tuckahoe and Egg Island areas in order to determine annual trends in production,

C. To compare results obtained by aerial and ground observations of broods on the same transect,

D. To record additional pertinent information in regard to waterfowl nesting and production.

The aerial transect method was first carried out in New Jersey in 1951 on a reconnaissance basis. Transects were established in the various strata of the State based on Braun's ecological classification. A sample design was drawn up by Mr. Earl L. Atwood, U. S. Fish and Wildlife Service Biometrician. The results obtained in 1951 by this sampling method permitted the elimination of those strata having populations below which it is feasible to sample. Accordingly, only the ditched tidal marsh, unditched tidal marsh, and the Atlantic Slope Section of the oak-pine region were sampled in 1952.

Ground observations on broods have been carried out in the fresh water impoundments at Tuckahoe since 1947 in order to determine trends in production. It must be pointed out, however, that the impoundments are being managed experimentally and such important factors affecting nesting and brood production as water levels and existing vegetation may vary considerably from year to year. Ground observations on broods were also conducted at Egg Island on transects representing a 20 percent sample of the area in 1951 and 1952. Additional data on the nesting population was also recorded.

Methods Used in Sampling, and Area Covered

Aerial Transect

All observations on the aerial transects were confined to a 1/8-mile segment. Altitudes from which observations were made varied from 50 to 300 feet. The planes utilized in this work were single engined Aeroncas.

The recommendation was made that all observations be carried out during the period 1/2 hour before sunrise to two and 1/2 hours after sunrise, and from 3 hours before sunset to sunset. In 1951 it was impossible to combine the flights to these periods as early morning fog and afternoon thundershowers were prevalent at the time the brood counts were carried out. Favorable weather conditions were encountered in 1952.

Ground Census - Egg Island

The 1/4-mile wide transects at Egg Island were usually traversed by three or four personnel walking abreast. One man with a small boat and outboard motor was always at hand to ferry the observers across the larger tidal creeks. When weather and tidal conditions were satisfactory, it was possible to cover approximately three miles of census line per day.

Ground Census - Tuckahoe Impoundments

The brood census method employed in the six fresh-water impoundments at Tuckahoe has varied with the water management. For instance, when early draw downs were employed, the observers were able to walk through each impoundment in a manner similar to that described for the Egg Island area. When high water levels were maintained, these areas were covered by boat.

Success of the Season

Aerial Transect

The results obtained from the aerial transects are summarized in Tables I and II. In 1951, a single coverage of each stratum was made. In 1952, each stratum sampled was covered twice.

Ground Census - Tuckahoe Impoundments

Data in regard to brood production in the Tuckahoe impoundments has been recorded for the past six years. Annual results which are considered comparable are summarized as follows:

Year	Species	Total Number Broods Observed	Average Number of Young
1952	Black duck	12	7.7
	Wood duck	3	5.5
		15	
1951	Black duck	8	5.3
	Wood duck	2	4.0
	Mallard	1	7.0
	Hooded merganser	1	7.0
		12	
1950	Black duck	9	6.1
	Wood duck	2	5.0
	Blue-winged teal	1	6.0
	Mallard	1	5.0
		13	

These figures indicate little change in the annual production within the impounded areas. However, late summer observations indicate that brood survival in 1952 was exceptionally good.

BROOD CENSUS AREAS - NEW JERSEY

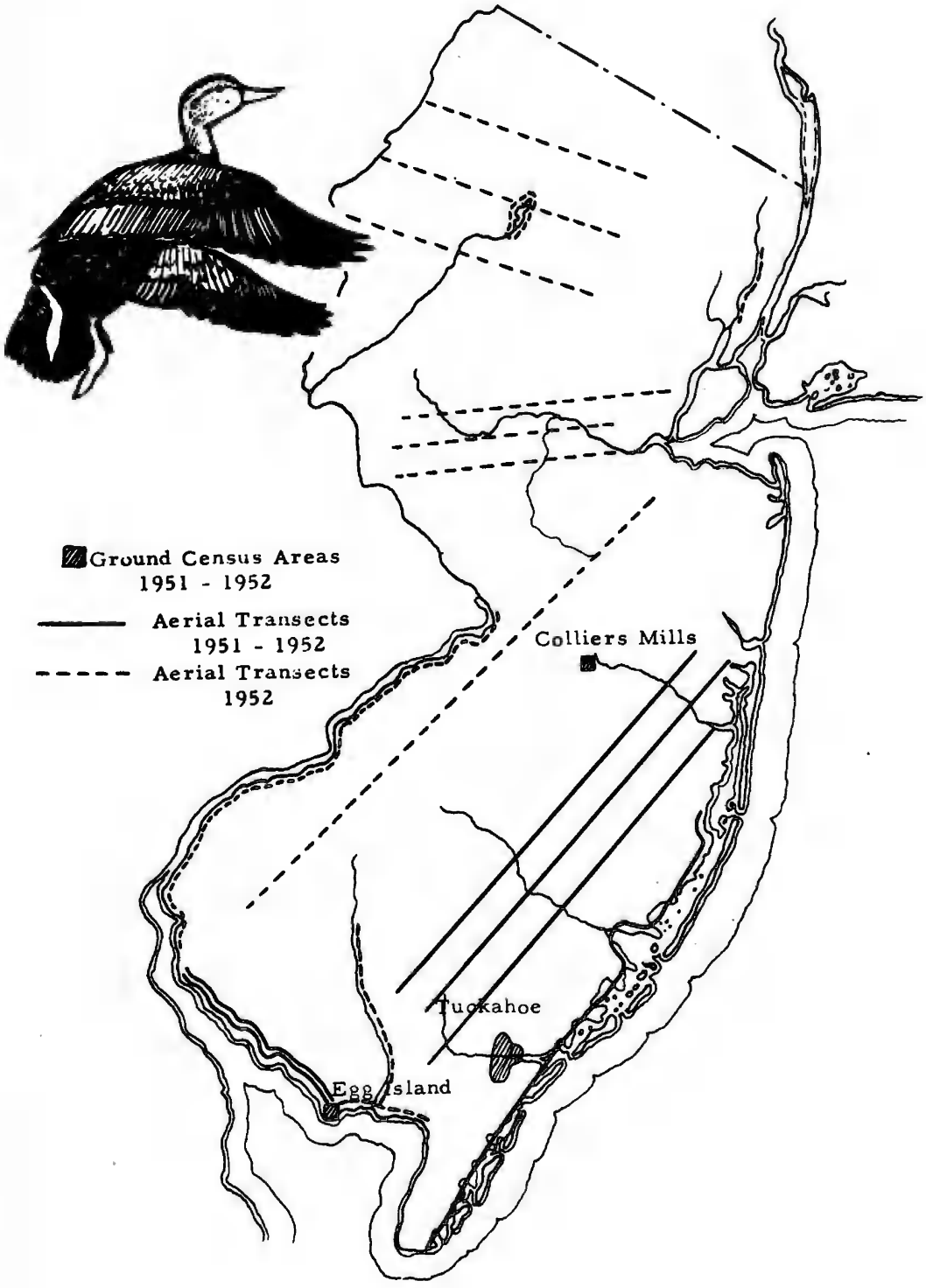

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Table I - Results of Aerial Brood Sampling in 1951

Strata Type	Total Size in Sq. Miles	Size of Sample in Sq. Miles	Ducks Observed in Sample		Ducks Observed per Sq. Mile		Population Index	
			Broods	Pairs	Broods	Pairs	Broods	Pairs
Glaciated	1,535	8.5	0		0		0	
Piedmont	1,361	9.4	0		0		0	
Oak-Pine	2,445	7.8	0		0		0	
Atlantic Slope	1,702	22.8	1		.04		74.6	
Estuarine Marsh								
Unditched	108	22.9	52	Not Recorded	2.27	Not Recorded	244.4	Not Recorded
Ditched	219	11.0	11		1.0		219.0	
Rivers	188*	63	1		.02		2.6	
Lakes	133*	80	2		.03		3.4	
Inland Marsh	8.8	1	0		0		0	

*Linear Miles.

Table II - Results of Aerial Brood Sampling in 1952

Strata Type	Total Size in Sq. Miles	Size of Sample in Sq. Miles	Ducks Observed in Sample		Ducks Observed per Sq. Mile		Population Index	
			Broods	Pairs	Broods	Pairs	Broods	Pairs
First Check								
Estuarine Marsh								
Unditched	108	9.3	8	29	.86	3.12	92.9	336.8
Ditched	219	8.5	0	8	0	.94	0	205.9
Atlantic Slope	1,702	22.8	2	-	.09	-	149.2	-
Second Check								
Estuarine marsh								
Unditched	108	9.3	18	12	1.93	1.29	209	139.3
Ditched	219	8.5	4	9	.47	1.06	103	231.9
Atlantic Slope	1,702	22.8	0	-	0	-	0	--

Ground Census - Egg Island

A ground transect 1/4-mile wide and 6 miles long, representing a 20 percent sample was established at Egg Island as there was little knowledge of the breeding populations on that area. In 1951, the transect was traversed on 5 occasions. Considering the size of the sample (928 acres), a relative intensive search was made for nests and broods. During 1952 the same transect was covered twice, however, the search for nests was much less intense. A comparison of the annual data gathered is presented below:

Species	No. of Nests Observed		No. of Broods Observed	
	1951	1952	1951	1952
Black duck	35	28	28	20
Gadwall	10	3	8	26
Blue-winged teal	1	0	1	1
Clapper Rail	11	3	-	-
Virginia Rail	5	1	-	1
Willet	27	31	-	-

Data on the relative values of the various types of tidal marsh vegetation in regard to waterfowl nesting cover can provide fundamental information as a basis for tidal marsh management in New Jersey. Such information was gathered in 1951 and 1952 and is presented in Table III.

Based on all available information, the average brood size of the various species observed in southern New Jersey are as follows:

Species	1951		1952	
	No. Complete Broods	Average Brood Size	No. Complete Broods	Average Brood Size
Black duck	68	4.2	27	4.7
Gadwall	9	8.0	37	5.4
Mallard	3	5.7	17	4.6
Wood duck	5	6.0	2	5.5
Blue-winged teal	-	-	1	4.0

Table III - The Nesting Cover Utilized by Various Species of Waterfowl on the Tidal Marsh Areas of the Tuckahoe and Egg Island Tracts

Nesting Cover	Black Duck		Gadwall		Blue-winged teal	
	Number	Percent	Number	Percent	Number	Percent
Spartina alterniflora	43	68.2	8	61.5	1	100
Spartina patens	1	1.6	3	23.1	-	-
Mixed Spartina alterniflora and Spartina patens	15	23.8	2	15.4	-	-
Scirpus Olneyi	2	3.2	-	-	-	-
Iva frutescens	1	1.6	-	-	-	-
Plant debris	1	1.6	-	-	-	-

Aerial Observations versus Ground Observations

In 1951 and 1952 at Egg Island, after each ground check for broods, aerial observations were made over the same transects. These data are presented as follows:

8 broods observed	6/1/51	Ground check
1 brood observed	6/3/51	Aerial check
29 broods observed	7/2/51	Ground check
9 broods observed	7/19/51	Aerial check
9 broods observed	6/12/52	Ground check
2 broods observed	6/15/52	Aerial check
38 broods observed	7/10/52	Ground check
12 broods observed	7/12/52	Aerial check

From these data it is evident that approximately three to four times as many broods are observed by the ground method of observation.

Weather and Water Conditions

In spite of a late spring, the majority of the broods at Tuckahoe were brought off during May. At Egg Island, where considerable predation and re-nesting occurs, it is difficult to correlate a hatching peak with weather conditions. Apparently the bulk of the nests in this area hatched in June, although some females were found incubating as late as July 11, 1952.

The usual high tides occurred during the nesting season and some nesting losses were observed on the low Spartina alterniflora marshes along the Atlantic Ocean. Nest destruction along the Delaware Bay shore due to high tides was less severe.

Breeding Population Trends

Based on data gathered by ground and aerial observations at Egg Island, it is felt that the over-all waterfowl production on that area increased slightly. Gadwall production in 1952 was notably greater than in 1951.

Although the number of broods produced during 1952 at Tuckahoe was comparable to previous years, brood survival was greater.

While the data recorded in 1951 and 1952 by the aerial transect method are not entirely comparable, it is the opinion of the writer that brood production on the ditched and unditched strata decreased slightly in 1952.

Summary

In summarizing it can be stated that in 1952, production data pertaining to waterfowl was obtained by ground census methods on the Egg Island and Tuckahoe areas. Over-all production on Egg Island increased slightly in 1952 while production on Tuckahoe was comparable to 1951.

Aerial transects were conducted in those strata having measurable populations, i.e., Atlantic Slope, unditched tidal marsh, and ditched tidal marsh. Since this method of obtaining indices for use in estimating brood production is entirely satisfactory, it will again be conducted in 1953. Based on results obtained in 1952, brood production on the above stratum was slightly less than in 1951.

WATERFOWL BREEDING GROUND SURVEY IN THE COLLIERS MILLS-SUCCESS LAKE AREA - NEW JERSEY

Paul D. McLain

Methods of Sampling and Area Covered

The Colliers Mills-Success Lake Area is located in Ocean County, about 4 miles east of New Egypt and about 20 air-miles west of the northern end of Barnegat Bay. The vegetation in the area is predominantly pitch pine (Pinus rigida) and oaks (Quercus sp.) in the Lakewood Sand section of the Coastal Plain. The Colliers Mills-Success Lake area, a public shooting ground, consists of about 5,500 acres on which there are 18 lakes and ponds having a total water area of about 320 acres.

The breeding ground survey began in 1951 when the ponds were placed under an experimental management program in an effort to produce waterfowl and other wildlife foods in the ponds by employing the principles of the complete and partial draw down management techniques. Secondly, it was hoped that this management would create needed nesting cover, and thereby render the area more attractive to waterfowl for nesting.

During 1951, two weekly surveys were made on all 18 lakes and ponds and several of the ponds were visited daily. Due to the dense cover in the form of brush and standing trees in the ponds, it was difficult to observe the broods and to make a complete brood count. During 1952 the areas were again surveyed, using the same technique as in 1951. Table I relates the species, number of broods, and the average brood sizes observed during 1951 and 1952.

Success of the Season

Table I - Summary of Waterfowl Production Data Obtained at the Colliers Mills-Success Area, Ocean County, during 1951 and 1952

	1951		1952	
Species	No. of Broods Observed	Average Brood Size	No. of Broods Observed	Average Brood Size
Black duck	2	5.0	4	4.7
Wood duck	6	5.5	3	4.3
Mallard	-	-	1	4.0

The increase in the number of black duck (Anas rubripes) broods during 1952 can probably be attributed partially to the experimental management program, since all four broods were located in the ponds operated on the draw down principle during 1951. Previous to 1951 the ponds were maintained at a maximum depth of about 4 feet of water. By holding the ponds at this depth the water was forced into the pine-oak association and there were relatively no grassy edges or other suitable cover for nesting. In addition, the ponds became invaded with white water lily (Nymphaea odorata) and bladderwort (Utricularia sp.) and there was little waterfowl food available to attract and hold ducks during the nesting season.

During the spring of 1951 some of the ponds were drawn down to expose the bottom and the edges, and during the summer months many grasses and sedges pioneered in around the back and edges of these ponds. By the spring of 1952 these plants formed a suitable nesting area around each managed pond.

In addition, the planting of Japanese millet (Echinochloa crusgalli) and the natural growth of Walters millet (Echinochloa Walteri) provided both food and cover in the ponds and made the area further attractive to waterfowl.

As an example, one 4-acre pond, which had no grassy edge previously, was drawn down in the spring of 1951. By September of 1951 a heavy stand of Walters millet had become established in the pond and along the edges, and in the back section the sedges and grasses grew profusely. This pond attracted ducks during the fall and winter months, and during the summer of 1952 two broods of black ducks and one brood of mallards (Anas platyrhynchos) were reared in this particular pond.

Table I shows a drop in the wood duck (Aix sponsa) broods during the 1952 season. This decrease in broods corresponds with a drop in the wood duck box utilization on the area and with the fewer paired birds seen during April and early May.

Weather and Water Conditions

Phenologically the spring was about two weeks later in 1952 than it was in 1951. The first mallard duck nest was found during March, but nesting did not reach its peak until early May. The ponds and lakes were not subjected to flooding due to heavy rain or run-offs because of the water level control structures, and few, if any, nests were lost due to this factor. Raccoons (Procyon lotor) were abundant in the area; two mallard nests and one black duck nest were thought to have been destroyed by these predators.

Summary

1. Bi-weekly surveys on foot were made for waterfowl broods on the 18 lakes and ponds at the Collier Mills-Success Lake Area during the spring and summer of 1951 and 1952.

2. The ponds in the Colliers Mills Area were managed on the complete and partial draw down principle to encourage the growth of waterfowl foods. It was also hoped that this management would result in the establishment of a grassy edge around the ponds which might be utilized as nesting cover.

3. There was an increase of from two black duck (Anas rubripes) broods in 1951 to four black duck broods in 1952. All four broods observed in 1952 were in ponds which provide the nesting edge and sufficient foods, such as Walters millet (Echinochloa Walteri) and Japanese millet (Echinochloa crusgalli).

4. Wood duck (Aix sponsa) dropped from six broods in 1951 to three broods in 1952. This drop in brood observations corresponded with a decrease in paired birds during the spring and a decrease in the wood duck nesting box utilization during 1952.

WATERFOWL BREEDING GROUND SURVEY IN NEW HAMPSHIRE

James A. Lee

Introduction

The waterfowl breeding ground survey forms a part of a three phase population inventory now being carried on annually by the New Hampshire Fish and Game Department. The data derived from this survey are useful in the formulation of hunting regulations and future management projects. It provides the State Fish and Game Department with annual information on breeding success, extension or shifting of ranges of various resident species and the use of different type habitats by the nesting species.

Methods of Sampling and Area Covered

The waterfowl population survey succeeds the waterfowl habitat survey, carried on in the years 1945 - 1948 inclusive, a project designed to evaluate and inventory the waterfowl habitat in the State. Upon the completion of the habitat survey, it became evident that more accurate information on the status of the many species of waterfowl that occur in New Hampshire, either as migrants or residents, was desirable. Accordingly, the waterfowl population survey was organized in the spring of 1949 and the breeding ground survey as a major part of it the following summer.

In 1952 the breeding ground survey was continued. The major share of the field work was conducted by the writer aided by Mr. Peter Brezosky, a student assistant. This work was carried on intensively through the months of June, July and August. Over 100 different waterways were visited, including most of those surveyed in 1951, as well as a few new areas. Conservation Officer Fred Scott covered the more important areas in the Pittsburg region for the third straight year. Other members of the Fish and Game Department contributed reports of broods they had observed in the course of their own field work.

Methods used in the 1952 survey were similar to those of the previous years. Emphasis was placed on the location of broods rather than on breeding pairs or nests. On the basis of previous surveys, representative water areas were selected for survey in all regions of the State and most of these were visited only once in order that as many of the areas as possible could be checked. As it seemed desirable not only to determine breeding trends from year to year but also the fate of broods during the current season, a number of areas were visited twice to provide these data. A few new areas were investigated as to their productivity and suitability as representative types of habitat to sample. It is known that the majority of waterfowl produced in New Hampshire come from the numerous small areas such as beaver ponds, oxbow ponds, marshy coves in lakes and ponds, meadow marshes, major streams, etc., where from one to several broods are raised. Large, extensive waterfowl producing marshes are few and atypical, and do not constitute in themselves an accurate sample of breeding conditions throughout the State. Also, these better areas with their extensive cover introduce a higher percentage of error into the survey than those more easily inventoried.

The methods used in the brood survey are as follows: each area as it is surveyed is covered in its entirety. Actual survey may be one of several methods or a combination. A number of the areas are adjacent to the road and can be covered from a car, especially with the aid of a window mounted telescope. More often it is necessary to seek out high vantage points around the area and cover it with binoculars or telescope. Many times it is necessary to climb a tree in order to view the area properly. A canoe is used only when the other methods are not feasible or after the other methods have been used and a further check is desired. As a canoe disturbs the ducks it is usually not possible to get a complete count of ducklings in a brood. All data are entered on mimeographed forms immediately after an area has been surveyed. Broods are tallied as being incomplete, complete, probable or possible, on the basis of the observations.

Data Collected - In collecting and tabulating the data, a classification of the State by natural divisions has been used. A map showing the divisions is included. (See Map 1). Representative areas in each division were censused for broods. The data consists largely of the number of broods and potential broods observed in each of the divisions. These figures are shown in Table I and include totals for 1951 for areas visited both years. Under broods are included the number of actual broods observed, the number of broods not seen but accounted for by the actions of maternal females and the number of probable broods as indicated by groups of immature ducks. Under potential broods are all surplus females which may have been breeding birds. The figures on potential broods are included simply because they may present a better measurement of production than is indicated by the total of reasonably sure broods.

Weather and Water Conditions

The spring of 1952 was characterized by cold, rainy weather. April saw many migrants staying later than usual in resting areas, especially in the southern half of the State. Snow and ice lingered until late April in the northern region of the State. Heavy rains in late May resulted in near flood conditions in many sections of the State. Field observations conducted at this time revealed abandoned nests, even by wood duck in boxes where the high water had partially submerged them.

Aquatic and marsh vegetation was retarded and observation of the areas in June was therefore, especially good.

Breeding Population Trends

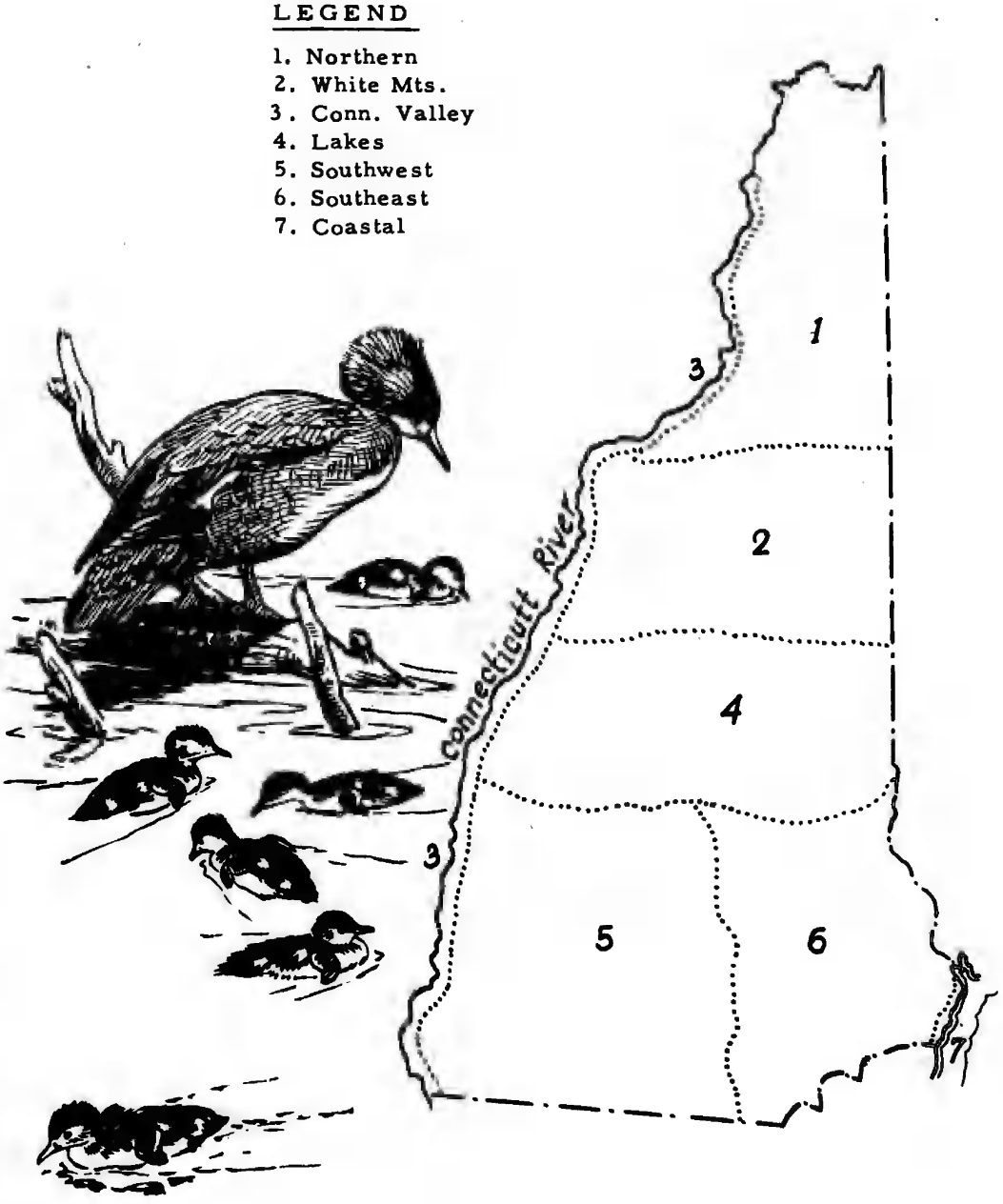
Examination of the figures in Table I reveals some interesting changes in brood production from the preceding year. Counting the combined totals of the broods and the potential broods, the variation for the grand total is about 13 percent.

The variations in the cases of the black duck and wood duck are 11.3 percent and 27.5 percent respectively.

The latter two percentages suggest a slight increase and a marked decrease respectively. The sampling methods as carried on during the past three years have proved to be accurate enough to show what they were intended to show: namely, the approximate relative abundance of the different species and any major trends that might occur. The slight increase in black duck broods (11.3 percent) may be the

WATERFOWL BREEDING GROUND SURVEY DIVISIONS

NEW HAMPSHIRE - 1952



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result of chance variation and as such this increase is not considered too significant. A comparison of the average number of young per brood in the various age classes as shown in Table II shows the broods to be larger in 1952. However, a larger number of non-breeding birds (156) were seen along the coast this year than last (66).

Wood duck production appears to have decreased considerably. A decrease of 27.5 percent below last year's brood production figure can be noted. A comparable decrease was noted in 1951 when production figures for that year were compared to those of 1950. Figures for wood duck box use are not included because they are as yet incomplete.

The ring-necked duck was first found breeding in New Hampshire in 1947 in the northern part of the Connecticut River drainage. As a new-comer to the State, the number of broods produced each year is relatively few. A slight decrease is noted this year but, due to the paucity of broods, this change is not considered to be significant, No new breeding locations for this species were discovered this year.

The goldeneye also reveals a slight decrease in production. Due to the habit of goldeneye families breaking up and dispersing, only a conservative estimate of the number of broods is possible. The northern section of the State was censused at a later date than last year and this is undoubtedly reflected in the number of broods seen. The goldeneye still remains a fairly common nesting bird of extreme northern New Hampshire.

The hooded and American mergansers are both found breeding in New Hampshire. The American merganser is most common in the northern region while the hooded is common throughout the State. No significant change in brood production this year over last has been noted for either species. The hooded merganser still remains New Hampshire's third most common nesting duck. It should be stated that brood figures for the American merganser are no measure of its relative abundance as compared with the other species, since the large streams, rivers and lakes where it breeds have not been given much attention.

Two records of mallards breeding within the State were obtained this year. One brood seen near Concord was the result of private stocking. A new breeding record for this species was obtained when a brood and accompanying female were observed in the quiet back-waters of the Magalloway River in the northern section of the State. There is a very good chance that this brood is the result of a black duck:mallard mating.

A male pintail was also seen on the Androscoggin River in the northern section, giving rise to speculation concerning its status as a possible breeding bird.

A pair of green-winged teal were seen for the second consecutive year on a pond in the White Mountain region but no evidence of a brood was uncovered.

Summary of Banding Operations

A limited amount of banding was done during the month of June. A total of 11 birds were banded, including 10 wood ducks and 1 goldeneye. In all cases the birds banded were adult females on a clutch of eggs in wood duck nesting boxes. These ducks were banded at 6 different sites around the State.

Table I - Number of Broods and Potential Broods Observed in New Hampshire in 1951 and 1952
Based on Comparable Coverage

SPECIES	NORTH		WHITE MTS.		CONN. VALLEY		LAKES		SOUTH-EAST		SOUTH-WEST		COASTAL		TOTAL	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Mallard																
Broods	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Potential Broods	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Total	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	2
Black duck																
Broods	5	12	5	11	5	7	2	8	5	11	11	11	6	4	39	64
Potential Broods	11	2	1	2	2	1	6	5	12	4	2	9	5	1	39	24
Total	16	14	6	13	7	8	8	13	17	15	13	20	11	5	78	88
Wood duck																
Broods	11	4	5	3	12	4	16	19	2	18	22	13	0	3	68	64
Potential Broods	1	0	4	0	4	1	23	11	12	4	15	9	1	4	60	29
Total	12	4	9	3	16	5	39	30	14	22	37	22	1	7	128	93
Ring-necked duck																
Broods	2	1	9	5	0	0	0	0	0	0	0	0	0	0	11	6
Potential Broods	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Total	2	2	9	6	0	0	0	0	0	0	0	0	0	0	11	8
Goldeneye																
Broods	17	13	0	0	0	0	0	0	0	0	0	0	0	0	17	13
Potential Broods	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Total	19	13	0	0	0	0	0	0	0	0	0	0	0	0	19	13
Hooded Merganser																
Broods	12	12	1	0	1	0	3	4	0	1	0	2	1	0	18	19
Potential Broods	2	1	0	0	0	0	1	1	0	0	0	0	1	0	4	2
Total	14	13	1	0	1	0	4	5	0	1	0	2	2	0	22	21
American merganser																
Broods	5	5	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Potential Broods	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	5	0	0	0	0	0	0	0	0	0	0	0	0	5	5
TOTAL BROODS	52	48	20	19	18	11	21	31	7	30	33	27	7	7	158	173
Total Potential Broods	16	4	5	3	6	2	30	17	25	8	17	18	7	5	106	57
GRAND TOTAL	68	52	25	22	24	13	51	48	32	38	50	45	14	12	264	230

TABLE II - Average Number of Young Per Brood by Species and Age Class 1951 - 1952
(Size of Sample Shown in Parentheses)

Species	1952 Age Class I	1952 Age Class II	1952 Age Class III	1951 All Age Classes	1952 All Age Classes
Black duck	8.8 (8)	7.0 (7)	5.0 (1)	5.94 (31)	7.75 (16)
Wood duck	9.0 (8)	5.0 (12)	4.8 (7)	7.29 (26)	6.24 (25)
Ring-necked duck *	6.7 (3)	5.8 (5)	-	5.11 (19)	6.12 (8)
Goldeneye	8.0 (3)	4.3 (4)	-	3.39 (9)	5.90 (7)
Hooded Merganser	8.5 (2)	6.3 (3)	7.5 (2)	5.83 (9)	7.30 (7)
American Merganser	5.0 (1)	12.0 (4)	-	6.44 (9)	10.60 (5)
Mallard	5.5 (2)	-	-	-	5.50 (2)

* Some broods included twice (once under each age class) in several cases.

WATERFOWL BREEDING GROUND SURVEY IN MARYLAND AND VIRGINIA

William R. Nicholson

Introduction

The waterfowl survey during 1952 was confined to the brood season. No breeding ground or nesting studies were made. It represents the first attempt - insofar as is known - to quantitatively measure the production of waterfowl in Maryland and obtain yearly index figures that will be comparable.

The aerial transect method of sampling was used almost exclusively. Flights were made over all areas that were thought to contain sizable breeding populations.

The aerial work was greatly facilitated by a cooperative arrangement between Delaware, Maryland, and Virginia. E. B. Chamberlain of the Delaware Game and Fish Commission was contracted to fly the transects in Maryland and Virginia and was released from his duties in Delaware during the time the work was done. The writer acted as observer on all flights over the parts of Maryland and Virginia that are located on the Delmarva Peninsula. C. P. Gilchrist of the Virginia Commission of Game and Inland Fisheries acted as observer on flights over the mainland sections of Virginia and Maryland. Results of the Virginia flights are incorporated in this report.

Methods Used in Sampling and Areas Covered

Bordering the Chesapeake Bay and Atlantic Coast are extensive marshes that are important as nesting areas for several species of waterfowl. The most extensive areas are located on the Delmarva Peninsula, bordering the Chesapeake Bay and adjacent rivers. They range from the fresh water aquatic type to the brackish marsh vegetated with three-square (Scirpus spp.), saltmarsh grasses (Spartina patens and S. alterniflora), and needle-rush (Juncus roemerianus). The brackish marshes are most widespread and many have numerous ponds and tidal guts interspersed with small areas of high ground that provide good nesting and rearing habitat.

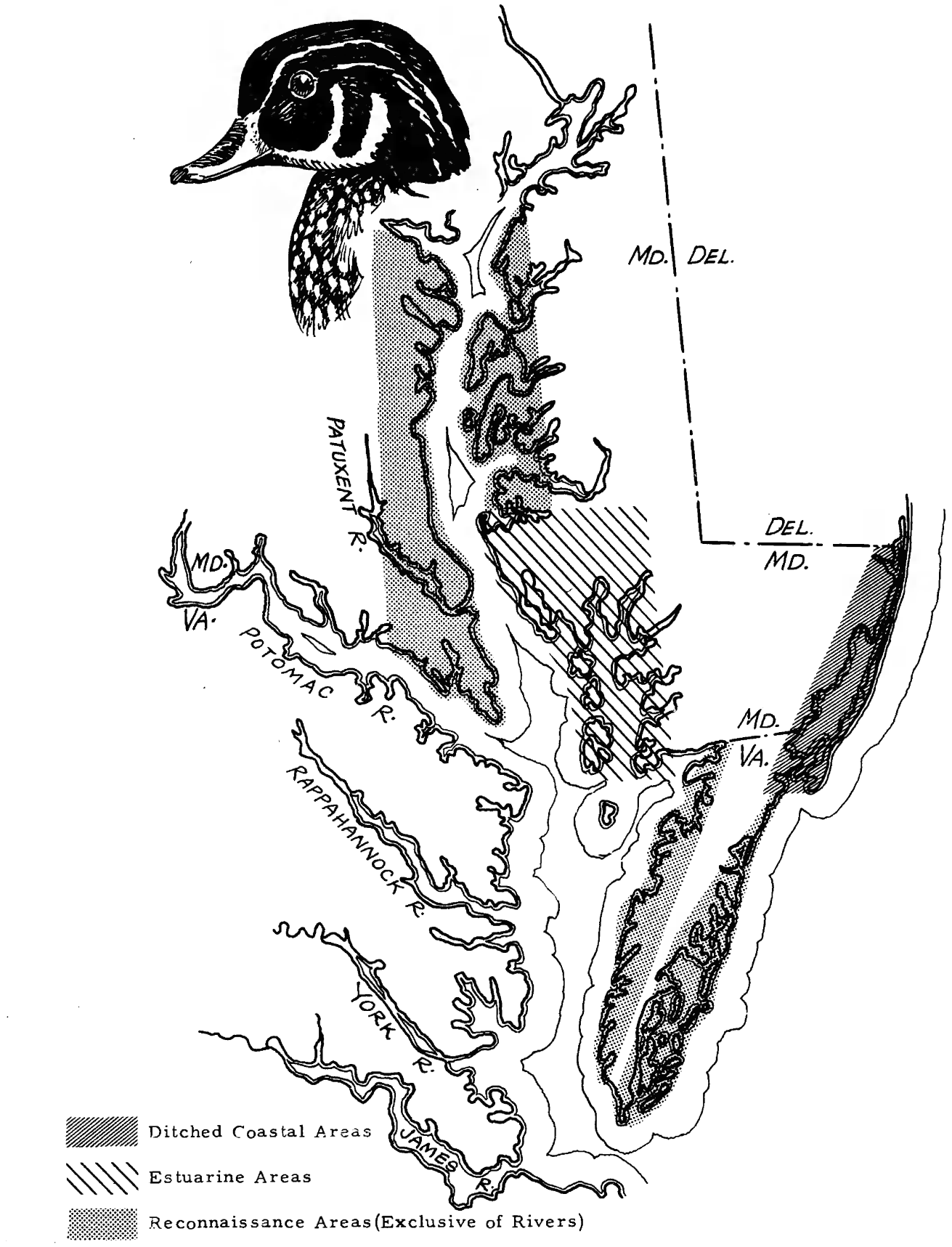
Similar marshes occur on the western shore of the Bay. However, they are generally small and much less extensive than those on the eastern side. Several large rivers providing an aquatic habitat are a major feature of this region.

On the Atlantic Coast side of the Delmarva Peninsula the marshes are highly saline and covered almost entirely with Spartina patens and S. alterniflora. The most important nesting species is the black duck. Blue-winged teal and wood ducks nest locally; in recent years gadwalls have been reported.

For the purpose of estimating waterfowl production by aerial censusing, a stratified sampling system has been developed and several habitat classifications adopted by the Fish and Wildlife Service and cooperating States. In Maryland and Virginia only two - or possibly three - types of habitat contain breeding populations that can be measured by aerial transects. The ditched coastal and unditched estuarine marshes are the most important. It has not yet been decided whether portions of the Atlantic slope type have breeding populations large enough to sample.

AREAS COVERED BY AERIAL TRANSECT IN MARYLAND AND VIRGINIA

1952



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Two large areas which include the best potential breeding habitat in Maryland were selected for systematic sampling. Both areas are known to contain relatively high populations of breeding waterfowl. One area comprises 144 square miles and is considered a ditched coastal marsh type. It includes marshes from the border of Delaware to Chincoteague, Virginia and is marked Area 1 on Map 1. A total of 88 linear miles of transects was flown in this area.

Another area totaling 538 square miles is considered an unditched estuarine type and includes all tidal marshes on the eastern shore from the Little Choptank River to Crisfield, Maryland. It is indicated as Area 2 on Map 1. In this type, 563.2 miles of transects were flown.

Since little or no data were available for many potential breeding areas, a considerable amount of reconnaissance flying over such areas was necessary in order to determine if waterfowl populations were high enough to measure by aerial methods. Over the Delmarva Peninsula - exclusive of the two areas previously described - 438 miles of overland transects were flown for reconnaissance purposes. Over the part of Maryland that is located on the western shore between the Potomac and Patapsco Rivers, 231 miles were covered. Over the Virginia mainland no overland transects were flown. Flights were confined to the shorelines of rivers and creeks, and data was broken down according to miles of rivers and creeks flown. Areas covered by reconnaissance flights, exclusive of rivers, are shown on Maps 1 and 2.

In addition to the overland transects flown in Maryland, special flights were made along the shorelines of all major rivers. A single flight was made over the middle of narrow rivers. Both shorelines of wide rivers were covered.

All flights were made at an altitude of 200 feet. On overland transects, waterfowl seen on a strip of 1/16-mile wide on either side of the plane (totaling 1/8-mile) were tabulated. On river transects all waterfowl along the shoreline were counted. The transects were divided into eight mile segments and the number of waterfowl recorded for each segment.

The transects over the Peninsula were flown on July 14, 15, 16 and 17. The Virginia mainland transects were flown July 21 and 22. Flights over the Maryland mainland were made August 5 and 6.

Success of the Season

Table I summarizes the data for the two areas that were systematically sampled. It should be noted that the average brood size is computed from the total number of broods seen on all flights over the Delmarva Peninsula, and not merely from the number observed in either type. Brood sizes varied from two to four. All broods were Class III black ducks. Broods of other species were not observed.

Table I - Brood Counts in Estuarine and Ditched Coastal Types

Type	Area in Sq. Miles	Miles of Transects	Area of Transects in Sq. Mi.	No. of Broods	Average Size of Broods
Unditched Estuarine	538	563.2	70.4	26	5.21
Ditched Coastal	144	88.0	11.0	4	5.21

The results of the reconnaissance surveys are presented in Tables II, III, and IV.

In Table II, the results of the overland flights are given. The areas covered include:

1. The unditched coastal marshes from Chincoteague to Cape Charles, Virginia.

2. The estuarine marshes and adjacent Atlantic Slope areas bordering the Chesapeake Bay from the Pocomoke River to Cape Charles.

3. The mixed Atlantic Slope and estuarine marshes located between the Little Choptank and Sassafras Rivers in Maryland.

4. The mixed Atlantic Slope and estuarine marshes between the Potomac and Patapsco Rivers on the western shore of Maryland.

Table II - Results of Overland Reconnaissance Transects

Area Covered	Approx. Area in Sq. Miles	Miles of Transect	Number of Broods Observed	
			Black Duck	Wood Duck
Unditched Coastal	190	136	0	0
Pocomoke River to Choptank River	130	120	2	0
Little Choptank River to Sassafras River	280	182	7	0
Potomac River to Patapsco River	1,028	231	0	1

Table III gives the results of the special river transects in Maryland, and Table IV gives the results of the river and creek transects in Virginia.

Table III - Results of River Transects in Maryland

Name of River	Miles of Shoreline Flown	Number of Broods Observed	
		Black Duck	Wood Duck
Sassafras	12	0	0
Chester	17	9	0
Choptank	47	3	0
Patuxent	55	3	2
Potomac	60	0	0

Table IV - Results of River and Creek Transects in Virginia

Area Covered	Miles of Shoreline Flown	Number of Broods Observed	
		Black Duck	Wood Duck
Major Rivers	464	9	16
Creeks	100	2	9

Since 1952 is the first year a brood survey was made from the air, no data from previous years are available for comparative purposes. The information obtained will provide a basis for work in future years. Many areas can be eliminated from consideration, while other areas may receive more intensive sampling. It is to be expected that a sampling procedure will evolve to provide the most complete and accurate coverage with the minimum of time and expense.

WATERFOWL BREEDING GROUND SURVEY IN MAINE

Howard L. Mendall

Introduction

This report summarizes the results of the 1952 waterfowl breeding studies in Maine. The work is conducted annually from April until mid-September by the personnel of the Maine Cooperative Wildlife Research Unit. This year's investigations were under the supervision of the writer, assisted by Malcolm W. Coulter. During the nest hunting activities, John M. Dudley of Calais was employed as field assistant. Considerable additional data for this report were supplied by J. William Peppard, waterfowl project leader of the Maine Department of Inland Fisheries and Game.

Methods of Sampling and Area Covered

The waterfowl breeding habitat in Maine was described in the 1948 report of this series. Coverage and techniques this year were essentially the same as in previous years, so the data are comparable. One change was made, however, in tabulating the population figures; calculated percentages of increase or decrease were used only for the three most numerous breeding species - black duck, ring-necked duck and wood duck. Three additional game ducks regularly breed in Maine (American goldeneye, blue-winged teal, and green-winged teal) but their numbers in any given year are very low in comparison with the other ducks mentioned. So few data have been obtained on the Unit census areas in recent years for teal and goldeneyes that it seemed advisable to exclude them from the percentage tabulations. This situation was discussed in more detail in last year's report.

Breeding Population Trends

The number of breeding pairs of black ducks, ring-necked ducks and wood ducks is given by census areas in Table I. For the sixth consecutive year, the initial breeding population of waterfowl in Maine showed an increase. The black duck, most numerous and most important species to the hunters, now appears to be at its highest population level in about ten years. Although the 1952 increase was slight, the species has shown steady improvement since its 1946 low point.

The other breeding ducks showed but few changes from last year. A moderate increase was recorded for the wood duck. The ring-necked duck, second in numbers to the black duck in the State, was present in Unit census areas in practically identical populations to those of a year ago. Although specific measurements were not made for the American goldeneye and the blue and green-winged teal, these ducks apparently exhibited little change from 1951; in connection with the latter, a slight increase in the blue-winged teal was balanced by a slight decrease in the green-winged teal.

Thus, while no important gains were shown by any of Maine's breeding waterfowl in 1952, the over-all population was a little better than a year ago, which indicates continuation of a favorable trend.

The status at the start of the nesting season of the six species of breeding game ducks is given in the following:

Species	Status in 1952
Measured on Census Areas	
Wood duck	13 percent increase
Black duck	6 percent increase
Ring-necked duck	1 percent decrease
Estimated	
Blue-winged teal	Slight increase
American goldeneye	No change
Green-winged teal	Slight decrease

General Breeding Conditions

The 1952 breeding season was very satisfactory. The break-up of ice, as well as the general phenology, was considerably later than in 1951 and was close to that of an average year. Water levels were more constant than a year ago. Although flash floods occurred the first week of June, these were largely confined to northern and eastern Maine. Moreover, since the nesting cycle was progressing at near average dates, the floods caused far fewer losses than those of 1951. This year the peak of the black duck hatch had already occurred when the worst of the two floods took place on June 7. In the cases of the late nesting ducks (ringnecks and teal) their nesting cycle was in a sufficiently early phase to permit re-nesting by a considerable number of those birds which did lose nests.

Nesting Success

During the nesting study a total of 108 nests was found, nearly all of which were of three species -- ring-necked duck, wood duck, and black duck. In all but three instances these nests were kept under observation until hatched or destroyed.

Based on the sample of 105 nests, hatching success for all species was 66 percent. This is higher than a year ago although it is lower than in the record year of 1950. It is close to the long-term average in Maine. Of special interest, however, was the high black duck success (64 percent). This is considerably better than in an average year for this duck, which ordinarily suffers greater nest losses than any other species in the State.

Although flood losses were not nearly as serious as last year, this factor again was important as a source of nest loss - especially to the ring-necked duck. Principal predation was by the semi-aquatic mammals, the raccoon and mink. Raccoon depredation was much higher than usual. By contrast the crow (ordinarily of considerable importance) was a minor factor in nest losses during 1952. For the first time in several years, not a single nest loss could be attributed to the red fox.

Success of the Season

Ducklings in Maine experienced one of the best rearing seasons since the Unit's waterfowl studies were initiated. Water levels were quite high at hatching time, and, although a drought prevailed through all of July, the drop in water levels was very gradual. This resulted in excellent cover conditions on most of the breeding marshes.

Clutch sizes were larger than a year ago, undoubtedly due in part at least, to less re-nesting. Brood sizes, as based on 119 records of complete broods, were not only much higher than in 1951 but were higher than the long-term average, especially for birds approaching the flying age. The size of Class I broods averaged 7.4 ducklings each, while young in the Class III age averaged 6.1 - a record high figure during the Maine studies. This would indicate an unusually successful rearing season.

Summary

1. The status of breeding waterfowl in Maine at the start of the 1952 nesting season was improved for the sixth consecutive year.

2. More constant water levels and slightly lessened predation resulted in higher nesting success than a year ago.

3. Rearing success of broods was much higher than in 1951.

4. Considering slightly increased breeding populations, slightly higher nesting success, and greatly increased rearing success, it is believed that the over-all waterfowl productivity in Maine during 1952 was substantially improved over last year.

Table I - Waterfowl Census Data - Number of Breeding Pairs

Study Area	Black duck Prs.		Ring-neck Prs.		Wood duck Prs.	
	1951	1952	1951	1952	1951	1952
St. John River, Van Buren	10	9	-	-	-	-
Portage Lake	6	5	16	17	5	3
Meduxnekeag Stream, Hodgdon	6	4	-	-	4	2
Musquash Stream, Grand Lake Stream	12	11	10	9	-	-
Pocamoonshine-Crawford Lakes	36	40	65	80	5	11
St. Croix River, Baring	9	10	-	-	4	5
Moosehorn Refuge, Calais	25	31	12	9	-	-
Pennamaquan River, Pembroke	4	5	22	12	-	-
Mattanawcook Lake, Lincoln	2	3	3	4	-	-
Penobscot River, Lincoln-Enfield	14	15	-	-	8	10
Pushaw Stream, Orono-Old Town	3	4	-	-	2	3
Davis-Holbrook Thorofare, Eddington	4	5	3	4	-	--
Corinna Stream, Corinna	9	8	15	10	12	9
Goose River, Belfast-Swanville	12	11	15	15	--	--
Snake Pond, Brooksville	--	--	3	2	--	--
Boyden Lake, Perry	--	--	--	--	3	2
Ruffingham Meadow, Searsmont	--	--	--	--	7	10
Scammon Marsh, Eastbrook	--	--	--	--	4	6
Total	152	161	164	162	54	61

WATERFOWL BREEDING GROUND SURVEY IN DELAWARE

Everett B. Chamberlain

Introduction

For the third consecutive season a breeding ground survey was carried out in Delaware. This survey, aimed at finding out as much as possible about waterfowl breeding in the State, utilizes both ground and aerial observations and both permanent and part-time personnel. In addition to the aerial method (100 percent counts) used last year, the aerial transect method was used this year.

Methods Used in Sampling and Area Covered

In order to have figures directly comparable to those obtained in 1951, broods were again tallied during the regular monthly aerial migration counts. These counts cover the entire State and all waterfowl that can be seen from the air are counted. Also, and again in order to have comparable data, two of the ground study areas used last year were covered again in 1952. Aerial transects, based on a sound sampling design, were also used.

Weather and Water Conditions

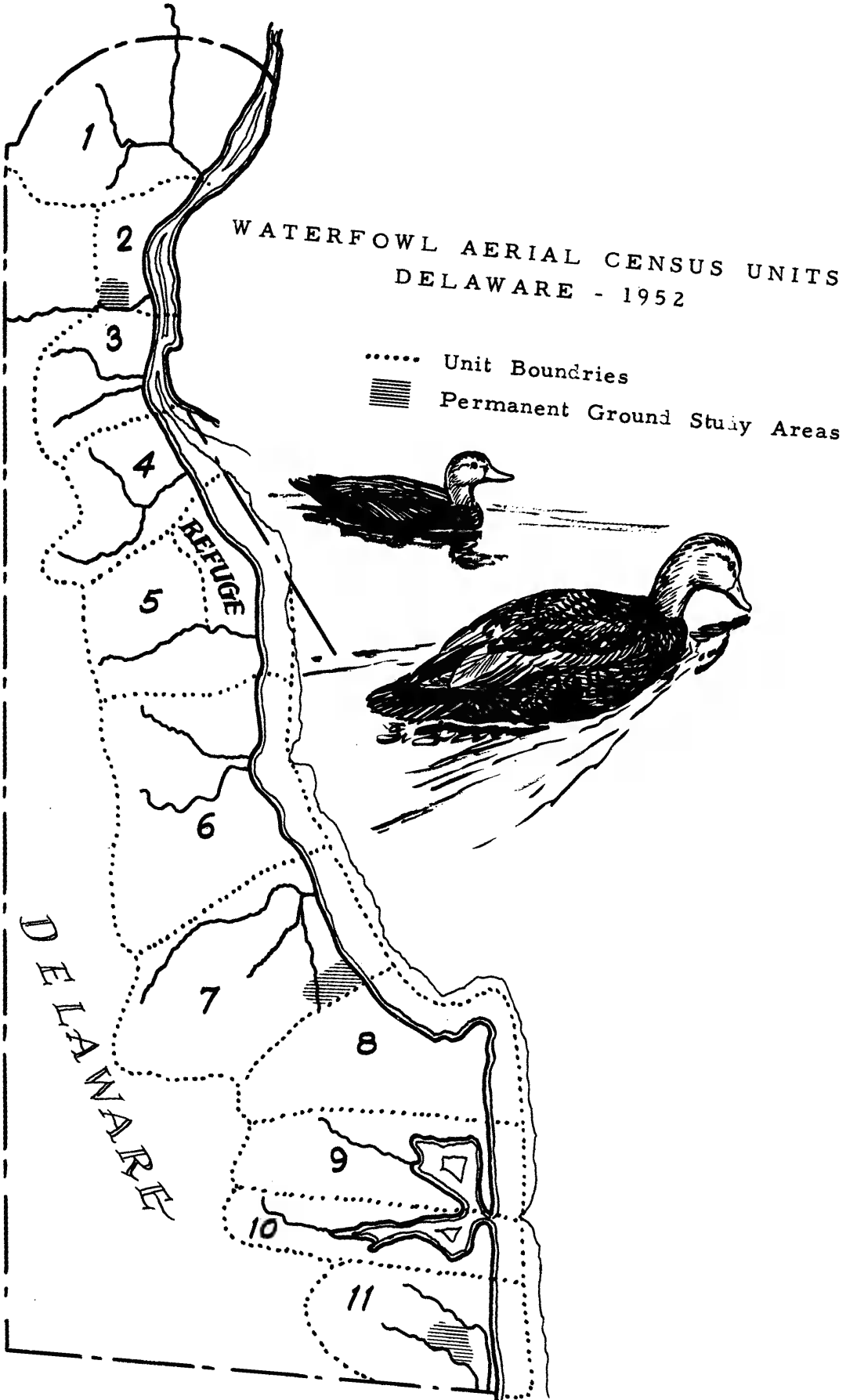
Weather and water conditions in Delaware during the breeding season were abnormal. During the early part of the season there was an excess of rainfall, so much of an excess that during the drought that followed many farmers had ponds in the middle of their cultivated fields. It seems likely that the high waterfowl populations in March and April were largely the direct result of this unusual amount of surface water. It is felt that many ducks delayed the northward flight because more than the normal amount of feeding and resting places were available. The differences in square-mile densities during the breeding seasons of 1951 and 1952 are shown in the accompanying graph. They are shown numerically, together with total population figures in Table I.

Table I - Comparison of Total and Square Mile Waterfowl Populations in Delaware 1951 and 1952

	Total Population		Waterfowl per Square Mile	
	1951	1952	1951	1952
March	26,374	38,797	128.48	189.00
April	5,180	9,919	25.23	48.32
May	1,193	1,056	5.81	5.14
June	1,221	1,322	5.95	6.44
July	1,600*	2,007	7.79*	9.78

* No count; estimated.

With the exception of the increases noted in March and April, weather and water conditions apparently had no effect on breeding populations of waterfowl in Delaware.


WATERFOWL AERIAL CENSUS UNITS
DELAWARE - 1952
Unit Boundries
Permanent Ground Study Areas
1
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REFUGE
DELAWARE

Delaware Breeding Ground Populations as Determined by Aerial Census

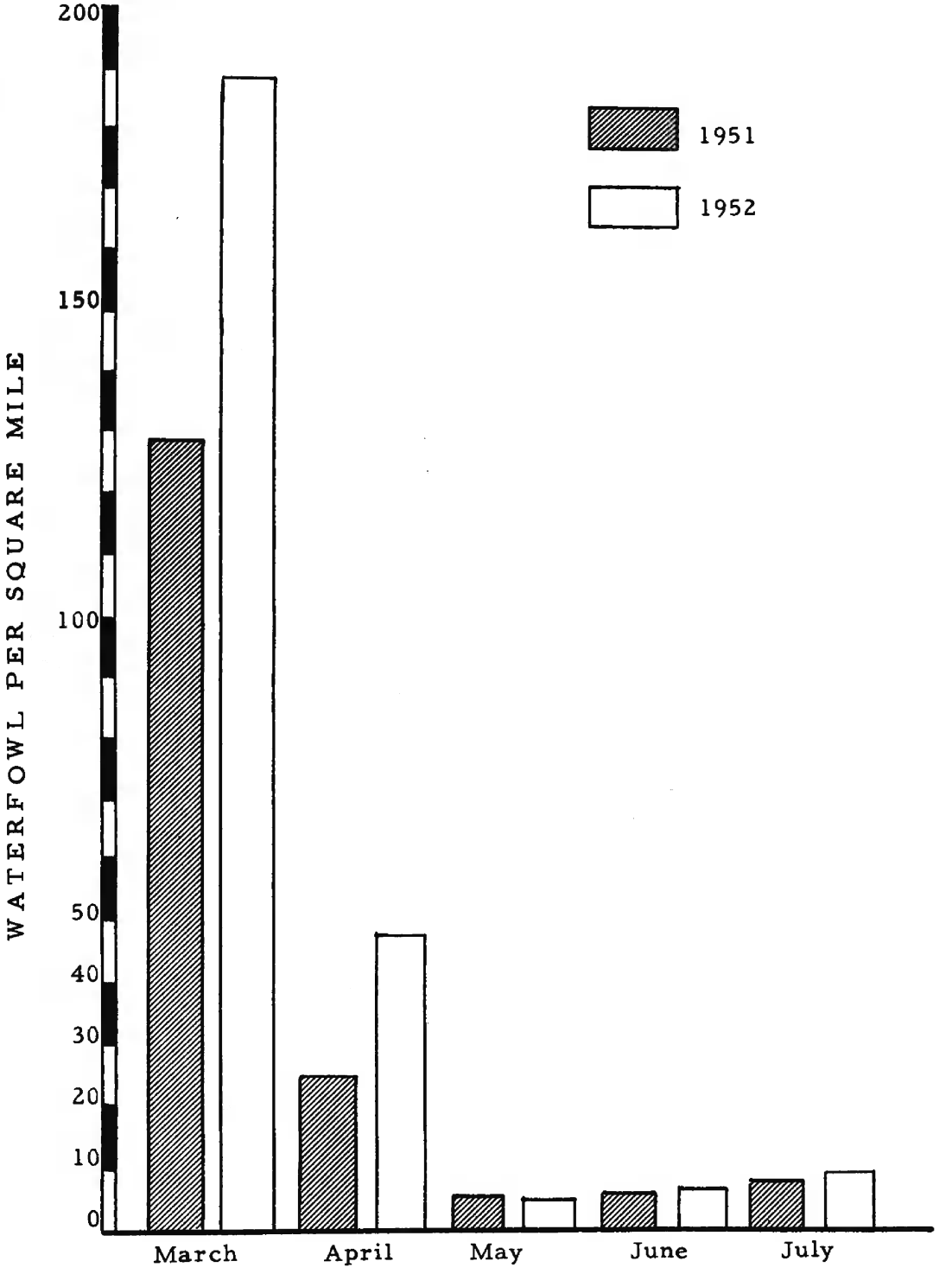

Table II - Data Obtained by Use of 1/8-Mile Wide Aerial Transects and Sampling the Various Ecological Strata Separately

Strata or Types	Area in Sq. Mile	Size of Sample in Sq. Mile	Ducks Observed in sample		Ducks Observed per Sq. Mile		Population Index	
			Broods	Pairs	Broods	Pairs*	Broods	Pairs
Atlantic Slope	784.9	98.1	1	1	T	T	80.05	80.05
Estuarine Marsh Unditched	177.4	22.2	7	109	.31	4.92	54.99	872.81
Estuarine Marsh, Ditched	62.6	7.8	0	5	0	0.64	0	40.06
Coastal Marsh, Ditched	40.6	5.1	0	5	0	0.98	0	39.79
Total							135.04	1032.71

* Singles observed were considered as pairs for this computation.

Breeding Population Trends and Success of the Season

Breeding population counts by the "100 percent aerial count" method for 1952 are shown in Table I. A map showing the location of the various aerial census units and the ground study areas is included. From the graph and Table I, both of which show the results of the monthly aerial counts, it will be seen that for all months except May there was some increase in waterfowl population as compared with 1951. The small decrease in May is probably the result of many females not being seen because they were incubating and does not reflect any actual decrease in the breeding stock.

The data obtained by the aerial transect method are in Table II. They are included, even though no comparable data exist for Delaware, since it is felt that they may be of some significance when compared with data from the same ecological types in other States.

In addition to information obtained by aerial methods, a further check on breeding populations was obtained by repeating ground studies on two of the three areas covered last year. Unfortunately it was impossible to obtain accurate information on the southernmost ground study area. Data obtained this year are in Table III and are compared with the data from the same areas for 1951.

Table III - Comparison of Brood Production on Ground Study Areas in Delaware - 1951 and 1952

Area	Species	No. Broods		No. in Broods		Av. per Brood	
		1951	1952	1951	1952	1951	1952
Dragon Run	Black duck	0	1	0	5	0	5.0
	Wood Duck	1	5	6	28	6.0	5.6
Primehook Neck	Black duck	12	15	84	96	7.0	6.7
	Wood duck	1	5	6	32	6.0	6.4
	B-w. teal	1	2	8	14	8.0	7.0
Assawoman *	Black duck	3	?	15	?	5.0	?

*While no regular study was possible this year in the Assawoman tract, it is known that at least two broods of black ducks and one of wood ducks were produced.

During the monthly aerial counts made in both 1951 and 1952, broods were tallied as seen. A comparison of the June counts for the two years is shown in Table IV.

From the data in Table IV it will be seen that brood size was somewhat smaller in 1952, but that there were more broods, and therefore greater total production. Probably the most accurate brood data are those in Table III. Combining the figures from this table for Dragon Run and Primehook Neck are the following:

1951	1952
15 broods	28 broods
104 young	175 young
6.93 - average brood	6.25 - average brood

Table IV - Broods Seen During Aerial Census (Delaware)- Comparison of June Counts, 1951-1952

Census Unit No.	Broods 1951	Broods 1952	No. in Brood * 1951	No. in Brood * 1952	Approximate Age 1951	Approximate Age 1952
1	1	1	6	9	8 weeks	10-12 weeks
2	1	0	4	0	?	--
3	1	1	7	6	5 weeks	4 weeks
	1		8		7 weeks	
	1		3		2 days	
	1		6		?	
4	1	1	3	5	2 weeks	10-12 weeks
		1		4 inc.		2 weeks
5	1	2	9	5, linc.	5 days	1- 5 days
	1	3	9	5,5, 12	2 weeks	?
		1		5		4 weeks
		1		4		2 weeks
		1		3		10-12 weeks
6	1	1	5	5	6-7 weeks	3- 7 days
	1	1	inc. (Wood duck)	7		1 week
	1	1	9	3	7 weeks	6 weeks
	3		30		?	
7	0	1	0	1 inc.	--	3 weeks
		1		7		4 weeks
		1		2		2 weeks
		1		7		6 weeks
		1		5		3 weeks
8	1	1	10	5	8 weeks	6 weeks
	1	1	7	3	?	4 weeks
9	0	0	0	0	--	--
10	0	0	0	0	--	--
11	0	0	0	0	--	--
Total	17	22	116	109		

* All black ducks unless otherwise noted.

Summary

1. Early season populations were higher in 1952 than in 1951, because of heavy rains which created additional feeding and resting places.

2. The number of young waterfowl produced was greater in 1952, although average brood size was smaller than in 1951.

3. Probable cause for smaller broods but higher total production:

   More habitat available in early season resulted in more nesting waterfowl. Severe drought in late season resulted in either (1) higher juvenile mortality or (2) complete loss of first nest with the usual smaller clutch from the re-nesting females.

Banding Operations

Because of other commitments and the lack of suitable trapping locations the summer banding program in Delaware did not get underway until the first week in August. At that time a cooperative agreement was worked out with Mr. Hickok, manager of the Bombay Hook National Wildlife Refuge, whereby trapping and banding is being carried out on the refuge by both State and Federal personnel. The birds listed in Table V were banded between August 6 and September 15, 1952.

Table V - Waterfowl Banded in Delaware - Summer 1952

Species	No sex or age	Adult		Immature		Females of Doubtful Age	Grand Total
		Male	Female	Male	Female		
Black duck		40	39	84	79	27	269
Mallard		18	29	10	9	10	76
Black-Mallard Hybrid		3	2	5	3	2	15
Blue-winged teal						1	1
Pintail						1	1
Gallinule	7						7
Total	7	61	70	99	91	41	369

WATERFOWL BREEDING GROUND SURVEY IN THE NORTHEASTERN STATES

Francis B. Schuler

Introduction

This report covers the summer production survey to July 20, with additional notes on spring breeding populations where available.

The number of comparable areas, upon which the data in Table I are drawn, has more than doubled over last year. The States of New Hampshire and Connecticut have contributed State-wide canoe surveys aggregating 54 areas. Data from the Massachusetts State-wide wood duck box check totaling 65 comparable areas were also available for the first time.

Use of the new form for reporting the sample area brood survey has introduced some bias that is difficult to evaluate. Unquestionably, the reliability of reports has been improved by this change, and an increased number of field checks per area is readily noticed on the data sheets. In comparing one year's production against another on an area basis, production figures for 1951 were re-computed to establish them on the same basis as the production figures for 1952.

Investigations aimed at developing aerial transect methods for production surveys have been continued. The States of Connecticut, Delaware, Maryland, New Jersey, and New York have actively engaged in these studies during the past season.

Weather and Water Conditions

State, Federal, and other cooperators were practically unanimous in stating that this was a later season than last year, as much as a week to ten days. Possible exceptions to this are the coastal areas from Long Island south. Early high-water levels that were maintained until at least the first of June, and in some sections for an additional two weeks, were reported from all sections of the region. Opinions as to the timing of high tides on the coastal marshes during the season have varied; apparently some sections escaped the excessive inundations normally experienced.

Breeding Population Trends

Little information is available on the early spring population. Mendall states in his report on Maine that the black duck shows a slight increase over last year, making a gain for the sixth consecutive year; a slight increase was noted for the wood duck, with the ringneck and goldeneye populations about the same as last year. A slight increase in the blue-winged teal was offset by a slight decrease in the green-winged teal population.

Success of the Season

A summary of the production data from 188 comparable areas is presented in Table I.

Substantial increases are shown here for the two principal breeding species: the black duck and the wood duck. Little information was available for the ringed-neck duck, gadwall, and Canada goose; however, the data on hand indicate an increase for these three species. The status of the goldeneye remains unchanged.

Undoubtedly, the early high water caused the abandonment of many nests, especially in the more rugged terrain of the region. Later flash floods occurring in late May and early June were not as damaging, being more local in nature and in some areas occurring after the peak of hatch. The high-water levels maintained have been decidedly beneficial in aiding brood survival. All competent observers indicated the excellent rearing conditions. Whether the July drought will offset these gains is not known at this time.

State personnel and others who did extensive work over large sections of their States have remarked that the production situation is at least as good as last year and in many instances better.

Summary

To date, the production data on our major nesting species, the black duck and the wood duck, show a definite increase. Other species, as the gadwall, mallard, ringneck, and Canada goose, show an upward trend, based on limited information. Only the blue-winged teal population has shown a downward trend. The status of the goldeneye remains unchanged.

TABLE I - Summer Brood Survey in the Northeastern States, 1952

(188 Comparable Areas *)

Species	Total Broods		Young Produced		Average Brood		PERCENT OF CHANGE			
							Young Produced		Broods	
	1952	1951	1952	1951	1952	1951	Increase	Decrease	Increase	Decrease
Black duck	435.2	318.2	2666.6	1919.7	6.1	6.0	38.9	-	37.0	-
Wood duck	330.1	299.0	2976.4	2610.7	9.0	8.7	14.0	-	10.4	-
Mallard	94.0	48.0	505.2	377.2	5.3	7.8	33.0	-	95.0	-
Blue-winged teal	26.0	44.0	120.6	211.8	4.6	4.8	-	75.0	-	69.0

* Number of areas by States: Connecticut, 28; Delaware, 4; Maine, 11; Maryland, 2; Massachusetts, 65; New Hampshire, 30; New Jersey, 10; New York, 2; Pennsylvania, 19; Rhode Island, 12; Vermont, 1; West Virginia, 4.

WATERFOWL NESTING SEASON ON NATIONAL WATERFOWL REFUGES, 1952

Richard E. Griffith

Comparison of refuge breeding ground surveys for the past season leaves no doubt as to the wide variation in production which may result from heavy run-off or excessive rainfall, both of which determine the pattern of water levels on nesting grounds. In some instances, flood conditions provided temporary nesting habitat, thus compensating for the loss of territory normally available. In several cases, however, comparatively abrupt shorelines resulted in progressive loss of nesting habitat as water levels rose. This relationship is clearly indicated in production records on several refuge nesting grounds. Obviously, the population trends exhibited by individual species under these conditions are not a true reflection of general species trends for the region.

Continued observation and study of the relationship between livestock grazing and waterfowl nesting indicate considerable local variations in waterfowl production, depending upon the growing season, the character of the date when grazing begins and the intensity of livestock use. On the Malheur Refuge, grazing intensity consistent with good range utilization standards resulted in close cropping of shoreline vegetation and considerable loss of nests through trampling. At the present time evidence points to the need for reappraising the livestock-waterfowl relationship in primary nesting areas where below average precipitation during the nesting season may result in increased grazing and livestock movement in nesting habitat.

Refuge population trends as reported below were established through a combination of pre-season surveys to determine the number of nesting pairs and followed later by a series of brood surveys so distributed through the season as to determine the significant variations in brood size and species, as compared with previous years, and, in addition, evaluate management practices which might be modified or initiated to increase the total production another season.

Atlantic Flyway

A cold, wet spring season delayed nesting somewhat, though appeared to have no significant effect on refuge breeding populations. Black duck, mallard and gadwall production on the coastal refuges varied little from that of 1951. Prolonged drought which began in the Pea Island, North Carolina area during the nesting season did not interfere with production on the refuge impoundments. Gadwalls showed an increase for the fourth consecutive year.

Total waterfowl production on the Montezuma National Wildlife Refuge in central New York was down 30 percent this year as compared with figures for 1950 and 1951, although the average brood size was larger.

There was evidence of increased predation by red foxes, as is to be expected in areas where the species has shown a definite upward trend. Predation by raccoons is still high on coastal marshes.

Mississippi Flyway

A comparatively dry spring season and rapid run-off provided excellent nesting conditions on the Mud Lake Refuge in northwestern Minnesota, and early observations pointed to an increased breeding population. Later surveys revealed a decline of about 25 percent from the 1951 figure. Redheads, scaup, ringnecks, canvasbacks and ruddy ducks all showed a decided decrease; the gadwall, a drop of 27 percent and the coot production was about 92 percent below last year's figure. Mallards, baldpates, pintails, green-winged teals and shovelers each showed increases of 100 percent or more over 1951, whereas the blue-winged teals dropped 54 percent.

About 200 miles southeast of Mud Lake the Rice Lake Refuge experienced heavy rains throughout the nesting season. As a result of flooding, most of the desirable nesting habitat was lost. Only about one-half the number of mallard and black duck broods were seen on the refuge when compared to last year's findings. Although some pintails nested on the refuge last year, none was observed this year, and blue-winged teal and wood ducks were fewer in number. Baldpates, alone, showed the only increase in brood numbers, while ring-necked duck counts remained about the same. The coot population seemed to be at an all time low.

On the Tamarac Refuge, weather conditions had a marked influence on nesting. All factors considered, everything pointed at first to a successful nesting season. However, many of the potholes dried up as the result of a very dry spring, after which there were several periods of heavy rain, thus causing temporary loss of vital habitat. An added complication was increased predation by skunks and raccoons. Mallard production was down slightly from that of last year, ringneck production remained about the same, large gains were shown by wood ducks, but blue-winged teal and goldeneye production showed a decided decrease. Very few gadwall and scaup broods were observed.

For the first time in several decades, the area originally occupied by the Horicon Marsh was reflooded, thus providing an increased area of nesting habitat. Possibly this is the reason why blue-winged teal showed an increase in production over that of last year, whereas on all other refuges in the Mississippi Flyway, except Union Slough, Iowa the blue-winged teal production dropped 30 percent or more. The redheads showed some increase at Horicon, while the production of other species was close to the 1951 figure. The coots took full advantage of the newly flooded marshlands, and their production jumped considerably from that recorded for 1951. The most notable event of the nesting season at Horicon was that of finding the first brood of baldpates which had been recorded there in recent years.

On the Union Slough Refuge in Mason County, Iowa additional nesting habitat became available as a result of development work completed late in 1951. This year's waterfowl nesting season was by far the most successful since the establishment of the refuge. The number of broods, the average size of broods, and the total young produced were far greater than the figures recorded last year. Mallards, black ducks, pintails, blue-winged teals, shovelers and wood ducks nested on the refuge. There was an increase of 98 percent in nesting coots over the number noted last year.

Brood surveys on the Seney Refuge in northern Michigan indicated a general decline in black ducks, mallards, baldpates, wood ducks, blue-winged teals and ring-necked ducks, all of which use the refuge marshes. There was also a downward trend in Canada goose production on the basis of a comparison with brood surveys of the past two years. The smaller brood sizes noted here reflected the same trend on other refuge nesting grounds used by Canada geese.

Opportunities for nesting throughout the Upper Mississippi Refuge are rather limited, and the potentialities are minimized as a result of fluctuating water levels in the navigation pools. A survey of about 50 percent of the potential breeding habitat indicated a slight increase in the number of broods as compared with the number recorded for the previous year. Wood ducks were by far the greatest nesters, while there were lesser numbers of mallards, blue-winged teals and black ducks.

Central Flyway

Flood conditions during the early spring provided an abundance of nesting habitat in the Bowdoin area, as well as throughout a large section of eastern Montana, and the 50 percent decline in the number of duck broods as determined from the series of field surveys is not a true reflection of productivity in that area, as pintails, mallards and blue-winged teals made good use of the numerous temporary potholes throughout the general area. After a progressive increase over a period of ten years, the Bowdoin goose colony seems to have approached the capacity of the refuge nesting grounds. About 200 goslings were raised in 1942; this year's figure was 2,000. Losses from botulism were extremely light considering water conditions. In addition, there was little evidence of predation.

On the Medicine Lake Refuge in Roosevelt and Sheridan Counties in eastern Montana, early observations indicated a sharp decline in the local nesting population. However, a greater number of broods was counted than was recorded in the 1951 surveys. Shovelers, baldpates and canvasbacks showed some decline, while redheads and green-winged teals made substantial gains. The Canada goose nesting colony started a few years ago has made no significant gains; however, it continues to hold its own. There were no losses from botulism at Medicine Lake, and predation was considerably below last year's level, possibly due to an intensive skunk control campaign carried out during the early spring and through the nesting season.

On the Red Rock Lakes Refuge in southwestern Montana, no goose broods were observed for the third straight year. A few adult Canadas continue to frequent that locality throughout the spring and summer months. Thus, it appears that this breeding colony has not suffered serious losses from hunting pressure or from other factors. Possibly the increased trumpeter swan population has had some bearing on the Canada geese forsaking nesting territory used in previous years. There was no significant change in the number of lesser scaup, gadwalls, mallards, ruddies, baldpates, shovelers and green-winged teals in comparison with production figures for last season.

The nesting marshes on the Crescent Lake Refuge in Garden County, Nebraska continued to suffer from high water levels for the fourth straight year. Levels in the Sandhill Lakes have interfered with nesting by puddlers, as well as by diving ducks.

Blue-winged teals and mallards were the principal nesters, with lesser numbers of ruddies, gadwalls, pintails, shovelers, redheads and canvasbacks in that order. Brood numbers as determined from 3 separate surveys on 5 of the Sandhill Lakes showed a slight downward trend for all species as compared with last year's figures.

On the Valentine Refuge, Cherry County, Nebraska this year's nesting season showed some improvement over that of the previous year in spite of unfavorable water levels on some of the nesting grounds. Increased lake levels, while causing some temporary loss of nesting habitat, was compensated by shallow flooding of meadows bordered by good cover; thus, there was no over-all loss of nesting territory. In order of abundance, blue-winged teals, mallards, ruddies, pintails and redheads were the most numerous nesters, followed by lesser numbers of gadwalls, shovelers, green-winged teals, scaup and ring-necked ducks. There was a slight increase in predation by coyotes and bull snakes.

On the Arrowwood Refuge above Jamestown, North Dakota the nesting population was approximately 30 percent below that of a year ago. This decline could not be attributed to water levels or habitat factors, as conditions appeared to be ideal and certainly more favorable than during the previous season when production was considerably greater. Of the 10 species of waterfowl nesting on the refuge, only the canvasbacks and ruddies showed any increase over last year's production.

Des Lacs and Lostwood Refuges in the northwestern corner of North Dakota were the only 2 national wildlife refuges in the State showing a substantial increase in waterfowl production for 1952. On Des Lacs, 3 brood counts were made during the nesting season covering approximately 70 percent of the brood habitat. A warm, early spring and dry weather were conducive to a higher nesting success. Statistics gathered over the past several years indicate that the present nesting season has witnessed the greatest number of broods, the highest average brood size and the greatest number of young produced since 1948. Brood counts revealed that the mallard was the dominant nesting species. There has been no sign of disease, and predation was not extensive. On the Lostwood Refuge more than 1,300 breeding pairs of ducks were counted in an airplane census in May, an increase of more than 300 counted during the same period last year. There was no botulism or other disease in evidence, but there was some predation by crows.

On the Upper and Lower Souris Refuges, counts of breeding pairs made during the nesting season indicated a decrease on both areas as compared with counts for 1951. Some increase was noted in the numbers of nesting mallards, canvasbacks and scaup, whereas there was a decrease in the number of blue-winged teals, gadwalls, baldpates and redheads. The coot population showed a sharp decline, and Canada goose production continued at about the 1951 level. There were no losses from botulism. However, predation by foxes, raccoons and skunks resulted in some losses.

Earlier indications of a larger breeding population at the Lacreek Refuge, Bennett County, South Dakota, were not borne out by subsequent brood surveys. The total production for the refuge was about the same as for 1951. However, the blue-winged teal, which was the number one nester in 1951, dropped to third place this year; the mallard and the gadwall occupied the first and second places.

Production of redheads and canvasbacks was about double that of the previous season. Nesting mallards and gadwalls displayed an unusual tendency to seek out old stubble fields some distance from the water, and a number of nests were found from 3/4 to 1-1/2 miles from the refuge pools.

The nesting season at the Sand Lake Refuge in South Dakota was a successful one. Data compiled last season indicate that there was a density of 5.08 duck broods per mile of shoreline with an average brood size of 6.0. The total production was approximately 2,300 ducks. This season's data show that there was an average of 6.5 broods of ducks per mile of shoreline, with an average brood size of 6.9, and that about 3,375 ducks were produced. The season was characterized by a large increase in the number of breeding pintails. Several broods of Canada geese were observed. There were fewer coots nesting on the refuge during the past summer than there were in 1950 and 1951.

Nesting activities at the Waubay Refuge, South Dakota were begun two weeks earlier this season than last. Blue-winged teal were the most numerous nesters and brood producers. Mallards and gadwalls were present in about the same numbers as last year. While pintails and redheads showed an increase in the number of nesting pairs, there was no increase in the number of broods produced. Canvasbacks and baldpates were seen occasionally, and American goldeneyes showed a definite increase in nesting. In spite of high water levels flooding several nesting sites, 11 broods of Canada geese were produced. There was also a slight increase in the number of coots nesting on the refuge.

Pacific Flyway

Favorable weather conditions and water levels contributed to a successful nesting season on the Lower Klamath Refuge. Gadwalls, mallards and redheads, in that order, were the principal nesters, while there were lesser numbers of shovelers, pintails, scaup, ruddies, and cinnamon teals. About 300 pairs of breeding Canada geese were observed, and numerous broods of coots were seen. There was some loss of waterfowl due to botulism and to predation by gulls.

Generally, weather conditions were favorable at the Tule Lake Refuge except for a late spring. Field surveys indicated a breeding population of 4,000 pairs of ducks and more than 200 pairs of Canada geese. Redheads were by far the most numerous nesters, followed by ruddies, mallards, gadwalls and cinnamon teals with lesser numbers of scaup, pintails, blue-winged teals and shovelers. The first brood of Canada geese was not seen until two weeks later than normal. Botulism accounted for the loss of some waterfowl, and there was some predation by gulls.

Waterfowl nesting was not quite so good on the Camas Refuge in Jefferson County, Idaho, as in former years. Redheads and mallards were the most numerous nesters with lesser numbers of gadwalls, canvasbacks, ruddies, pintails, shovelers, teal and scaup. Canada goose broods were conspicuous by their absence, and it is believed that flood conditions prevented the geese from nesting.

The goose nesting survey begun 3 years ago on the Snake River Refuge, Idaho was made this year on April 14, 15 and 16. The survey included all the islands from the Walters Ferry bridge to Olds Ferry, Oregon, which is a distance of approximately 115 river miles. A total of 204 nests was found this year, as compared to 146 a year ago. Of the 204 nests located, 46 were within the area comprising the Snake River

Refuge, an increase of 16 nests over the last year's total. In that section of the river between Homedale and Ontario, there was a decrease of almost 100 percent from the 1951 survey. In the Ontario to Olds Ferry area, nest counts showed an increase of over 30 percent from the 1951 survey. Because of the high water in the Ontario-Olds Ferry area, a recheck was made to determine the nest loss due to high water. Of the 110 nests rechecked, 36 had been flooded out. Duck nesting on this area was very good, and all evidence pointed to a 10-15 percent increase over that of recent years.

On the Ruby Lake Refuge in Nevada the duck production was about the same as that of last year. There was a greater number of broods this year than last, but the brood size for all species of nesting ducks dropped from 6.7 young per brood last year to 6.3 young per brood this year. Last year the most numerous nesters were canvasbacks, redheads, mallards and cinnamon teals. This year, redheads were in the lead, followed by canvasbacks, ruddies, mallards and cinnamon teals. There were no scaup or pintails observed this year. It is estimated that Canada goose production was down about 50 percent this year as determined by the brood counts. There was no botulism or other waterfowl disease, and predation was not extensive.

The breeding duck population figure for the Stillwater Refuge in Nevada was higher this year than in 1951, and the 1951 figure was a two-fold increase over that of 1950. This increase, in part, can be attributed to the high water conditions which afforded additional nesting habitat. In spite of the increased number of nesting pairs, however, nesting success was lower, so that there was a slight decrease in the total number of young produced. Redheads, cinnamon teals, mallards and gadwalls were the principal nesters. Goose broods were few and scattered. While there is apparently no predation problem, botulism accounted for the loss of some waterfowl.

Nesting cover and food conditions on the Bear River Refuge in Utah were especially good throughout the period. Because of a late spring, goose nesting was two weeks later than usual. But despite the later hatch, goose nesting and brooding conditions were considered satisfactory, and the number of young geese produced was only slightly below the 1951 figure. Although the total number of duck nests was less than that of last year, it is believed that this is merely the reflection of a later season, as brood counts made throughout the season indicate an increase in the production of most species. In a comparison of brood counts made this year with those of last year, it is noted that there are large increases in the production of redheads, ruddies, mallards, gadwalls, pintails and shovelers. Fewer coot broods have been observed this year than last year. Botulism accounted for the loss of some waterfowl.

Resident populations of waterfowl on the Malheur Refuge in Oregon differed very little, if at all, from those of last year. Despite high water conditions, there was a fairly good hatch of Canada geese, in contrast to the low production of last year. The individual clutch success was slightly over 60 percent and the total production of geese at Malheur was about two and one-half times that of 1951 and very similar to that of 1950. It is estimated that there was about a 70 percent success for the refuge duck nesting. Duck production was about 8 percent below the average of the past five years.

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